U.S. STEEL NATIONAL TUBE WORKS
Along the Monongahela River
McKeesport
Allegheny County
Pennsylvania

HAER No. PA-380

HAER
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
P.O. Box 37127
Washington, DC 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

U.S. STEEL NATIONAL TUBE WORKS

HAER No. PA-380

LOCATION: The U.S. Steel National Tube Works is located on the right bank of the Monongahela River, .1 mile downstream from its confluence with the Youghiogheny River, in McKeesport, Allegheny County, Pennsylvania.

DATES OF CONSTRUCTION: 1872, 1906-09, 1929-30, 1950

PRESENT OWNER: USX Corporation, Regional Industrial Development Corporation

PRESENT USE: Closed 1987, resumed pipe production in 1988 as the Camp Hill Works.

SIGNIFICANCE: Established in 1872, the National Works of McKeesport is the oldest of six plants (Homestead, Edgar Thomson, Duquesne, Irvin, National and Clairton) which, until the collapse in 1982, comprised US Steel's Mon Valley works. From 1872 to 1901, the plant experienced a period of autonomous development. Even after it became a subsidiary of US Steel in 1901, the plant was operated on a more independent basis than the other Mon Valley plants. At this time National was the world's largest pipe producer. The National Works has always produced only one type of product - iron tubing and pipe. A strong demand for iron tubing and pipe was initiated by the industrialization and urbanization of the nation in the nineteenth century. Major advances in inspection techniques originated here, as well.

HISTORIAN: Michael Workman, 1989-90, 1993

PROJECT INFORMATION: The U.S. Steel National Tube Works documentation project is part of a larger multi-year effort to document the historic steel mills of the Monongahela Valley by the Historic American Engineering Record (HAER), a division of the National Park Service, U.S. Department of the Interior, dedicated to documenting historically significant engineering and industrial works in the United States. The Monongahela Valley Recording project was cosponsored in 1989-90 by the Steel Industry Heritage Task Force, Jo H. Debolt, Chair, and in subsequent years by the Steel Industry Heritage Corporation, August Carlino, Executive Director.

Documentation was prepared under the direction of G. Gray Fitzsimons, HAER Historian/Engineer. Formal photography was done by Martin Stupich. Michael Workman served as the project historian. Editors in HAER's Washington office were Dean Herrin, Michael Bennett, and Lisa Pfueller Davidson.

Three additional steel mills were recorded as part of the 1989-90 documentation of historic steel mills in the Monongahela Valley:

U.S. Steel Edgar Thomson Works	HAER No. PA-384
U.S. Steel Duquesne Works	HAER No. PA-115
U.S. Steel Homestead Works	HAER No. PA-200

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AN OVERVIEW HISTORY OF THE U.S. STEEL NATIONAL TUBEWORKS

Introduction

On March 18, 1982, Vice President George Bush arrived at McKeesport, Pennsylvania to tour US Steel's National Works, the 115-year-old steel pipe plant where 600 workers had just been laid-off. As Bush and his entourage drove past the gates of the plant, once the largest pipe maker in the world, blue-jeaned blue collar workers lined the road. Many were angry. Some displayed signs deriding "voodoo economics." Others cursed Italian steel and asked for import quotas. After a short tour, Bush spoke. He assured the steelworkers, telling them "not to worry." Given time, he said, President's Reagan's policies would work.[1]

Despite the Vice President's assurance, the National Works and two other US Steel plants in the Mon Valley, Homestead and Duquesne, were shut down in the next five years, victims of the great collapse and restructuring of the U.S. steel industry in the 1980s. Only an heroic and concerted effort by national, state and local political leaders, USX, and the steelworkers and their union, the United Steel Workers, could have saved even part of the plants. For several reasons such an effort was never mounted.[2]

The decision to close the National plant came down from USX (US Steel was renamed USX in 1986 after it acquired Marathon Oil and Texas Oil) in February, 1987, following a 184-day strike, the longest on record. August 28, 1987 was the last day of operations. After five years of layoffs and downsizing, only 22 maintenance workers remained to punch-out on that final day.

In 1987 the question which faced USX and local officials was what to do with the 133.9-acre McKeesport site. Located on a river bench along the right bank of the Monongahela River, just 0.1 mile downstream from its confluence with the Youghiogheny, most of the land had been devoted to iron and steel manufacture since 1851. Even before the plant was closed, the decision had been made to turn at least part of the property into an industrial park. In December, 1984 McKeesport Mayor Louis Washowich convinced US Steel to demolish its idled blast furnace plant in the middle of the site and convert 43 acres into an

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[1]"VP Assures Workers on Tour of Tube Plant," McKeesport Daily News, March 18, 1982.

[2]See John P. Hoerr, And the Wolf Finally Came: The Decline of the American Steel Industry, (Pittsburgh: University of Pittsburgh Press, 1988) for the best treatment of this topic.

industrial park. No development took place, however. In March, 1987, after making its decision to close the plant, USX conveyed the entire site to the Regional Industrial Development Corporation of Allegheny County for conversion to an industrial park. In December, 1987 a small, but symbolic, first step was taken in the redevelopment process when USX leased the 1964 Electric Resistance Weld Mill to Camp Hill Corporation, which promptly restarted the facility.[3]

Before further development could take place, a survey and evaluation of the site was necessary in order to determine what buildings and machinery were suitable for preservation and reuse within the parameters of the industrial park plan. In cooperation with county officials and the Pennsylvania State Historic Preservation Office, the Historic American Engineering Record (a division of the National Park Service) conducted a survey in the summer of 1989 to determine which facilities merited preservation because of their historic significance. The entire 133.9-acre site was carefully inventoried and photographed, and a report submitted to county and state officials. This report constitutes a thorough documentation of extant machinery and buildings at the site, as well as a brief delineation of the plant's technological development.

In February of 1990, county officials announced their plan for the redevelopment of the McKeesport site. Renamed the Industrial Center of McKeesport, it was to be dedicated to light and medium manufacturing. Although a small number of the older pieces of machinery were slated for preservation, the remainder were to be auctioned-off or scrapped. The metal shed buildings were to be demolished to make way for the construction of several manufacturing units. Already one company, Aluglass of Pennsylvania, had announced its plans to establish a manufactory of aluminized paper on the site and was scheduled to break ground later that year. Several of the brick buildings, significant for historic and architectural reasons, were slated for rehabilitation and adaptive reuse as offices or for light manufacturing: 1) the 1889 W. Dewees Wood office building or superintendent's house, 2) the 1876 main office building (oldest structure on the site), 3) the 1908 coupling building, 4) the 1905 roll shop, 5) the 1910 brick shed, 6) and the 1906 main pipe

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[3]"Demolition Clears Way for Industrial Park," Daily News, January 12, 1985; "Pact Seen Opening Portion of National," Daily News, December 5, 1987.

mill.[4]

This essay is an historical overview of the National Works of McKeesport. The main focus is the early years, mainly because existing scholarship on the works has concentrated on its twentieth century history. Established in 1872, the National Works is the oldest of six plants (Homestead, Edgar Thomson, Duquesne, Irvin, National and Clairton) which, until the collapse of 1982, comprised US Steel's Mon Valley Works. From 1872 to 1901, the plant experienced a period of autonomous development, and unlike Homestead, Edgar Thomson, and Duquesne, it was never associated with Andrew Carnegie. Even after it became a subsidiary of U.S. Steel in 1901, the plant was operated on a more independent basis than the other Mon Valley plants. As former National employees are fond of relating, the plant was not listed in the phone book under U.S. Steel until 1963, when it was brought under the aegis of the Central Corporation.

Early History of Industry in McKeesport

The National Works has always produced only one product. Tubing and pipe are basic components of modern industrial civilization. A strong demand for iron tubing and pipe was initiated by the industrialization and urbanization of the nation in the nineteenth century. Steam engines and boilers required durable and precisely machined tubing, and corrosion-resistant, water-tight pipe was needed for gas, oil and water transmission and well casing.

In the first half of the nineteenth century, nearly all of the American supply of iron tubing was imported from Great Britain (chiefly Scotland), because American iron men had not yet mastered the craft. The tools and expertise required to shape wrought iron into a perfect cylinder and weld it so that it would withstand pressure were simply unavailable. In 1832 Morris, Tasker & Morris, of Philadelphia, established the first shop for making welded pipe in the United States. Other plants were built in Eastern Pennsylvania, Eastern New York, New Jersey, and Massachusetts. By the early 1860s there were about one dozen pipe mills in the country, but none west of the Allegheny mountains.[5]

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[4] "Save Building List Outlined for Mill Sites," Daily News, February 16, 1990.

[5] William T. Hogan, Economic History of the Iron and Steel Industry in the United States Vol. 1 (Lexington, Massachusetts: Lexington Books, D.C. Hearth and Company, 1971): 50; J.M. Camp and C.B. Francis, The Making, Shaping and Treating of Steel Fifth Edition (Pittsburgh and Chicago: Carnegie-Illinois Steel

With the rapid growth of the oil industry after the drilling of the first successful well at Titusville, Pennsylvania in 1859, the demand for tubular goods expanded. As was so often the case in this period of American history, Yankee capital and ingenuity responded to the industrial challenge. In 1869 John Flagler of New York joined with "men of the highest standing in commercial and financial circles" of New York and Massachusetts to form the National Tube Works Company at East Boston.

John Haldene Flagler, who was later called "the man who did the most for McKeesport," was born in Cold Spring, Putnam County, New York in 1836. He attended the academy at Patterson, Dutchess County, New York, and in 1854 entered the iron business with his two uncles, John and James Haldene. The Haldenes' firm in New York City operated the Greenwich Iron Works, which was engaged in a general iron and steel business. Like Samuel Slater, the young Flagler journeyed to Europe to study the industrial arts. After learning European methods of making iron tubes, he returned to America in 1860 and was placed in charge of the Boston branch of the business. Here he introduced the manufacture of wrought iron tubing.[6]

The most important of the "men of the highest standing" who associated with Flagler in forming the National Tube Works Company were his brother, Harvey, and his father-in-law, James C. Converse (1817-1891). Little is known of Harvey Flagler, and he apparently played only a minor role in the formation and development of the company. Converse, on the other hand, became president and was followed by two of his sons into the company. He was a prominent businessman from Greenfield, Franklin County, Massachusetts who served as the chairman of the first Massachusetts board of railroad commissioners. The Flagler and Converse families provided leadership for the National Tube Company from its inception until its merger with US Steel in 1901. In addition to this inner circle, two silent partners were brought into the company as incorporators. W. S. Eaton, president of the Boston Belting Company (which made rubber belting) and director of two Boston banks, brought capital and

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Corporation, 1940): 1310.

[6]Allen Johnson and Dumas Malone, ed., "Flagler, John Haldane," Dictionary of American Biography, (New York: Charles Scribner's Sons, 1930): 452;"Flagler, John Haldane," The National Cyclopaedia of American Biography Vol. 14, (James T. White & Company, 1910); "History of Tube Works in 50 Years," The Daily News, September 18, 1922. Quote about Flagler in McKeesport's Old Home Week Celebration, (McKeesport, 1960): 36.

financial expertise. He was made treasurer of the company. P.W. French, of whom little is known, was chosen as secretary.[7]

In 1869 the new firm built the first National Tube Works at East Boston and began making lapweld, wrought iron pipe. The machinery for the mill was built by Secor & Company of the East River Iron Works of New York City. Flagler hired the superintendent of the East River company, George Matheson, to install the equipment in a 20' x 125' building. Matheson was retained as superintendent to operate the works. He hired James Cassidy, a welder in Morris and Tasker's works in Philadelphia and considered one of the best pipe and tube workers of the day, as foreman. The majority of the skilled workers were brought in from Morris and Tasker's and Allsons's pipe mills in Philadelphia. The product of the new works was mainly boiler tubes, but it also produced 2" oil well tubing, 5 5/8" casing, and 9" O.D. (outside diameter) pipe, the latter being the largest size produced anywhere in the United States. The company was an immediate success. By 1873, the East Boston mill employed 400 men and had an annual capacity of 20,000 tons. The company had become a major supplier of tubing for pumping operations and for pipe lines in the booming oil fields of Pennsylvania, West Virginia, and Ohio.[8]

Notwithstanding its initial success, the National Tube Work's East Boston plant was not well located to take advantage of the oil boom. Nor was it well located to secure supplies of raw materials. The company had to transport coal and iron plates from Pennsylvania (iron sheets for small size tubing were available from the Bay State Iron Works of Boston), then ship the finished product back to the same region. The company resolved to relocate.[9]

In 1870 John Flagler journeyed to southwestern Pennsylvania

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[7]Quote in "History of Tube Works in 50 Years, The Daily News; information on Eaton from Professional and Industrial History of Suffolk County, Massachusetts, Vol. 2 (Boston: Boston History Company, 1894): 333 and Vol. 3, p. 453; information on Converse from Francis M. Thompson, History of Greenfield, Massachusetts, Vol. 2 (Greenfield, 1904): 871.

[8]"History of Tube Works in 50 Years," Daily News; Hogan, Economic History of the Iron and Steel Industry, Vol. 1, 275; "The National Tube Works," The Iron Age 12 (November 13, 1873): 13.

[9]Ibid.

to find a factory site that would be closer to raw materials and markets. At this time, McKeesport was a river town of 2,500 people just entering a period of rapid transition. It was one of the oldest towns on the lower Monongahela River. George Washington was the first white man recorded to visit the land at the confluence of the Monongahela and Youghiogheny Rivers when he called on the old Indian Queen Aliquippa in 1753. In 1795 John McKee, Scottish businessman and land speculator, laid out a town at the confluence of the two rivers which he called McKee's Port. The town grew slowly, and by 1817 there were only 21 houses, "none of which made any pretentions to architectural beauty." By 1830 the town was simply a country village noted for its stills, breweries, and horse track. But because of its excellent position and abundant coal reserves, it was in a leading position to play a prominent role in the emerging industrial economy.[10]

The first coal mine was opened near McKeesport in 1830 by John Harrison, a town blacksmith. Others soon joined, and a large coal trade developed. The product was floated downstream on barges built in the town. After the dams on the lower Monongahela were completed in 1842 and those on the Youghiogheny in 1851, the mining and shipment of coal and the building of barges became the principal businesses of the town. McKeesport grew, merchants prospered, and the town attracted other industries.[11]

McKeesport's first iron works was built in 1851 by Richard B. Gilpin, who erected a rolling mill on the river bench near the confluence of the two rivers. Gilpin's associate in this venture was his son-in-law, W. Dewees Wood, a Quaker whose family had been engaged in the manufacture of iron in Philadelphia since 1771. As a young man, Wood had studied the sheet iron business, and, according to one tradition, traveled to Russia to learn the art of making planished sheet iron. (Until this time, the only planished sheet iron available in America was imported from Russia.) Of great value because of its strength and resistance to corrosion, planished iron was used in the construction of locomotive engine jackets and for roofs, rain gutters and downspouts. From his study, Wood developed and later patented a process for making the highly-prized product. In 1855 he took over the Gilpin works and began making planished sheet iron under

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[10]Thomas Cushing, History of Allegheny County (Chicago: A.Warner & Co., 1889): 723-731; Hoerr, And the Wolf Finally Came, 164.

[11]Cushing, History of Allegheny County, 731-32.

the firm name of Wood, Moorhead & Company.[12]

In the same year the first railroad came to town. With a subscription of $100,000 from the city of McKeesport, the Pittsburgh and Connelsville Railroad, running along the east bank of the Youghiogheny, was completed. The P&C was later taken-over by the Baltimore & Ohio Railroad and became its Pittsburgh division. Later, in 1883, the Pittsburgh, McKeesport & Youghiogheny was built on the west bank of the Youghiogheny.[13]

In 1855 McKeesport's rapid industrial development was noted by the town newspaper, the Weekly Standard, which boasted that the city had:

> A furnace, rolling-mill and Russia sheet-iron factory, two foundries, five steam sawmills, one boatyard, twelve coalbanks in the immediate neighborhood, two tanneries in town, eight principal stores and a number of groceries, two bakeries and confectioneries, several butcher-stalls, with a great variety of mechanics.[14]

John Flagler's search for a manufacturing site in 1870 led him to a five acre tract at McKeesport, the "old rope walk" property. Fulton, Bollman & Company, had manufactured rope and twine there beginning in 1862, but in 1868 they moved their plant to Elizabeth, New Jersey. Flagler later reminisced that when he first saw the tract, cluttered with burned rope and debris, he at first considered it not "attractive" enough. However, being a "practical man," he was soon swayed to recommend its purchase because of its advantages. The tract was located near the confluence of two navigable rivers, and it had a connection with the Baltimore & Ohio Railroad, so the transportation of both raw materials and the finished product was assured. Fuel was readily available in the form of coal. (The existence of natural gas in the area was unknown at this time.) Fullman, Bollman & Company

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[12] Cushing, History of Allegheny County Pennsylvania, 735-36; "W. Dewees Wood, Obituary," The Iron Age (January 12, 1899): 14; McKeesport's Old Home Week Celebration, 26-27; "Wood Works' Anvil Chorus," U.S. Steel News (April, 1953): 28-29. Also see Harleston R. Wood, "Alan Wood: A Century and a Half of Steelmaking," The Newcomen Society of England in North America (New York, San Francisco, Montreal: Newcomen Society, 1957): 8-16.

[13] Cushing, History of Allegheny County, 733-34.

[14] Ibid., 733-34.

had left several buildings suitable for reuse. Moreover, the adjacent property was the site of the Woods & Lukens works, from which plate and sheet iron could be obtained.[15]

The arrival of National Tube Works Company, along with the growth of planished iron works, reorganized in 1871 as W. D. Wood & Company Ltd., initiated a thirty-year period of rapid industrialization in McKeesport based upon iron and steel manufacturing. The decline in the coal business was more than counterbalanced by the iron and steel boom. Although there were no iron furnaces in the city until 1890, the plentiful supply of pig iron available in the Pittsburgh region prompted two other firms to set up manufactories in McKeesport in the 1870s. In 1874 the United States Iron and Tin Plate Company Ltd., erected a mill for manufacturing tin and terne plate. In the same year, the Sterling Steel works was built nearby by Jones, Ingold & Company. Using the crucible steelmaking process, the latter company produced stainless and fine tool steel. Both were located along the Monongahela River about two miles downstream from the National site, in a part of town known as Demmler.[16]

<u>Development of National Tube Works in the Late 19th Century</u>

The National Tube Works would soon became McKeesport's largest manufactory. The growth of the company, particularly in the period from 1871 to 1893, was phenomenal as it enlarged and improved its facilities again and again, increased its work force, and expanded production. By 1894, it was the largest tube works in the world, the largest industrial employer in the

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[15] Cushing, <u>History of Allegheny County</u>, 736; "National Tube Company," <u>U.S. Steel News</u>, February, 1937, 4; "National Plant 100 Years Young," <u>U.S. Steel News</u>, September-October, 1972; Walter S. Abbott and William E. Harrison, <u>The First One Hundred Years of McKeesport</u> (McKeesport: Press of McKeesport Times, 1894): 46.

[16] Ibid., 739-40; Hoerr, <u>And the Wolf Finally Came</u>, 165; Abbot and Harrison, <u>The First One Hundred Years of McKeesport</u>, 48-51. According to <u>McKeesport's Old Home Week Celebration</u>, p. 49, the "first tinplate manufactured in the United States was rolled at Demmler in a small plant built there in 1873 by the U.S. Iron and Tinplate Co." This claim cannot be substantiated. Hogan notes that tinplate was produced in the United States in 1858-1859. However, Hogan does write that after the tariff of 1875 wrecked the United States tinplate industry--and closed the Demmler mill--the first to manufacture tinplate after the passage of the McKinley Act in 1890 was the United States Iron and Tinplate Company, Ltd, of Demmler in October of that year, Hogan, <u>Economic History of the Iron and Steel Industry</u>, 348-51.

Pittsburgh region, and, according to one writer, the "wonder of Western Pennsylvania."[17]

Technological pioneering was a hallmark of the company's rapid development in this period. As John Flagler finalized the purchase of the tract in 1871, plans were drawn for the construction of the new plant. The company decided to adopt a new technology. At the instigation of Flagler and superintendent George Matheson, who traveled to the Castle Iron Works in England to investigate the advanced methods used there, the decision was made to use Siemens regenerative gas furnaces in place of the old style coal furnaces for heating the pipe. The company acquired exclusive rights to the Siemens patents for pipemaking in the United States.

Backed by Boston capital and spurred by a rapidly expanding market, the company would make advances in pipemaking, iron rolling, and steel-making technologies in this period. Like the adoption of the Siemen's furnaces, much of the new technology was simply borrowed from the more advanced European iron industry. However, this sort of technological transfer was amply supplemented by the ingenuity of Flagler, his superintendent, George Matheson, and the skilled workers at the plant.

Ground was broken for the new works in April, 1872. A 160' x 360' building was erected to house four Siemens lapweld furnaces and four coal-fired bending furnaces, along with threading and testing equipment. The Siemen's furnaces would burn coal gas produced at the plant. The old rope walk buildings were utilized for the coupling forge and tapping departments and a machine shop. Until 1879, when the National Rolling mill was established on-site, skelp was obtained from the Pittsburgh mills. On September 13, 1872 the first welding furnace was put in operation. According to one account, bender Patrick Bligh and superintendent George Matheson "pulled the first pipe," 2" oil tubing, on that day. The experiment with the Siemens furnaces proved a success: whereas 170 pieces of 2" tubing were considered a good ten-hour output at the East Boston works, 500 pieces were produced in the same amount of time at McKeesport.[18]

Until 1887, when steel tubes were first made at the Riverside Iron Works in Benwood, (near Wheeling) West Virginia,

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[17] Abbot and Harrison, <u>The First One Hundred Years of McKeesport</u>, 46.

[18] "History of the Tube Works in 50 Years," <u>Daily News</u>, September 18, 1922.

pipes and tubes were manufactured from either cast iron or made from rolled wrought iron. Cast iron pipe, a foundry product, was too brittle for most purposes, so until 1895, when the manufacture of seamless tubes began in the United States, tubular products were made mainly from skelp, a long, flat strip of rolled, wrought iron. The basic technique for making tubes from skelp had been developed in Europe, mainly in Scotland. Wrought iron was rolled into a length equal to that of the finished pipe and a width equal to its diameter. The skelp was then scarfed or conditioned with heat, to rid it of surface defects and to bevel the edges to ensure a square weld. It was then shaped by heating in a furnace and pulling it through a die. It was welded in two ways: lap weld and butt weld. In the lap weld process the edges were beveled so that when they overlapped the thickness of the pipe wall at the welding point was consistent with the rest of the pipe. The butt weld process required drawing the skelp through a funnel-shaped opening in the die called the welding bell, which welded the edges together. Both types of pipe were then subjected to finishing processes. First the pipe was passed through sizing rolls to obtain the proper outside diameter. From there, it was directed through the straightener, or cross rolls, consisting of two rolls set with their axes askew, to straighten it and provide a clean finish. It was then cut to the proper length and threaded.[19]

With the success of the McKeesport plant, the National Tube Works Company shut down the East Boston works in 1873. It had already transferred most of its best workmen and their families to McKeesport. Of the Boston investors only the Flagler brothers and President James Converse made the move to McKeesport. President Converse was accompanied by his two sons, E.C. and James H. Converse, who began "at the bottom" and later worked their way up. George Matheson, superintendent at the Boston works, came to McKeesport and served as superintendent until 1880, when he severed his connection with the company and formed the American Tube and Iron company at Middletown, Pennsylvania. His son, A.S. Matheson, succeeded him as superintendent. About 100 hands were employed the first month of operation, and the first monthly payroll amounted to $11,000.[20]

By February, 1873--after a second furnace was put into operation--the works had an annual capacity of 50,000 tons. The

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[19]Hogan, Economic History of the Iron and Steel Industry, Vol. 1, 50; 191-192; Camp and Francis, The Making, Shaping and Treating of Steel, 1310-27.

[20]"History of Tube Works in 50 Years," Daily News.

company employed 365 men in the following departments: machinist, pattern maker, engineer & fireman, mason & helper, brazier, carpenter, roll setter, pipe fitter, plug turner, blacksmith, gas producer, store keeper, oiler, firemen at bending furnaces, testing pumps, straightener, boys, coal wheeler, teamster, watchmen, threader, grinder & boys, men at furnaces, floorman, welder, welding furnaces, bending furnaces, scarfing benches.[21]

The plant's early history was marked by spectacular expansion and equally spectacular misfortune. On April 9, 1873--just as No. 3 furnace was ready to come on-line--a "destructive calamity" occurred. The roof of the mill building collapsed. The workers were able to escape without injury, but the falling debris broke the gas main. The gas ignited and the entire building burned to the ground. Undaunted, the company quickly rebuilt the mill, and by September, 1874, it was back in operation with four furnaces.

From 1872 to 1874, the plant made only 2" to 9" O.D. lap-weld pipe. In 1874 the company constructed facilities for the construction of butt-weld tubes in sizes smaller than 2". This mill was in operation for only two years when it, too, burned to the ground. George Matheson considered it "just as well" that this mill was destroyed because it was outfitted with old-fashioned welding equipment. He resolved to rebuild the mill and install equipment to utilize a new experimental process that he had observed in his trip to England.[22]

A new butt-weld mill, incorporating Matheson's improvements, was built on the same site in 1876. It contained three welding furnaces and one bending furnace outfitted with equipment for making both small and large diameter butt-weld pipe. Matheson's method for welding large-diameter pipe used two bells, rather than one as in the old technique. The skelp was passed through the first, then a second, slightly smaller one, in order to shape and weld it. For smaller sizes, only a single bell, improved and patented by Matheson and worker, John Norton, was used.

In 1875, after the company entered into a contract to

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[21]Ibid.; "The National Tube Works," The Iron Age 12 (November 13, 1873): 13.

[22]"History of Tube Works in 50 Years," Daily News; Hogan, Economic History of the Iron and Steel Industry Vol. 1, 275. Hogan appears to have based his account of the nineteenth century history of the National Tube Works on the Daily News article.

furnish several miles of 10" O.D. lapweld pipe for a high-pressure water line in California, superintendent Matheson devised yet another pipemaking technique. Until this time 9" O.D. was the largest size made. It had proven difficult to pass skelp of this size or larger through a die, and as a result the process was slow and expensive, and the product was often not uniform. Matheson built a set of bending rolls to shape pipe 10" and larger and in 16' lengths. He also developed a better scarfing machine for the larger sizes. The company continued to make improvements, and by 1880 it could produce 15" lap weld pipe twenty feet in length.[23]

Until 1875, National Tube Works Company concentrated solely on pipemaking, which was essentially an iron finishing operation. The quality and cost of iron skelp that the company purchased in the Pittsburgh market varied, and this affected the quality of its product and the cost of production. At times, iron was not to be had at any price, and the company was forced to idle its operations. The company's response to this uncertain situation was to expand its operations so as to become more self-sufficient. Its movement towards vertical integration began in 1875 when a foundry for making welding bells and other castings needed in the works was built.[24]

In 1879 the company took a large step towards self-sufficiency by establishing facilities for making its own iron skelp under a separate, but closely allied company, the National Rolling Mills Company. A four and one-half acre tract (the Donahue Ways property) was acquired just west of the pipe works and National Rolling Mill No. 1 was built. Plans for the new facility were prepared by superintendent Matheson. Once again Matheson adopted the most advanced technology available. For making wrought iron, the Siemens furnace, in use in no other place in the country except Springfield, Illinois, was used. Eight double puddling furnaces on the Siemens principle were built. Twenty gas producers, for making gas from coal to fire the furnaces, were built adjacent to the new building. The mill machinery consisted of a 9-ton hammer, a rotary squeezer, a muck train, a universal plate mill and a continuous mill. The continuous mill was one of the first to be put into service in the United States and remained "one of the marvels of rolling mill practice" until it was replaced in 1906. It had 10 stands of rolls, all driven at different speeds by spur gearing from one

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[23]"History of Tube Works in 50 Years," Daily News; Hogan, Economic History of the Iron and Steel Industry Vol. 1, 275-76.

[24]Ibid.

engine. It took an iron muck bar and delivered the finished skelp in sizes up to 10' wide by 100' long without rehandling. It even included a stand of rolls which scarfed or beveled the edges of the skelp for making lap-welded tubes. To run the new rolling mill, skilled workers were imported from England and Scotland.[25]

Finding the capacity of the rolling mill inadequate to supply its needs, the National Tube Works company, through the National Rolling Mills company, purchased the Ormsby Iron Works on Twenty-Fifth Street on the South Side of Pittsburgh in 1880. Established in 1863, the mill contained twenty single puddling furnaces, five heating furnaces, and three trains of rolls. It increased the annual capacity of National to 40,000 net tons. This mill, known as National Rolling Mill No. 2, was transferred to another subsidiary, Republic Iron Works, Ltd., in 1882. It continued to supply skelp to the McKeesport pipe mills until around the turn of the century.[26]

In 1881 the National Tube Works company established another subsidiary, the National Forge and Iron Works, to build a mill for making charcoal iron, a high quality product used in the manufacture of boiler tubes. This mill, built on the McKeesport site, held twelve forge fires, one run-out fire, one steam hammer, and a set of slab rolls. It made blooms and billets for boiler tubes and boiler plate, and it had an annual capacity of 8,000 net tons.[27]

In 1886-87 the company expanded its iron making capacity again with the construction of another puddling and rolling mill at McKeesport. Instead of the Siemens, the company built the conventional coal-fired puddling furnaces. One observer noted that since fuel was very cheap at McKeesport, the savings made by the use of the Siemen's furnaces had not compensated for their high initial cost. National Rolling Mill No. 3, consisting of thirty single puddling furnaces and two sets of 3-high muck rolls, was put into service in November.[28] The town's newspaper, the Daily News, boosted the addition:

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[25]"History of Tube Works in 50 Years," Daily News.

[26]American Iron and Steel Institute, Iron and Steel Works Directory, 1880.

[27]Ibid.

[28]"History of the Tube Works in 50 Years," Daily News.

> A thrill of delight will be created in the spinal column of the average man and run clear down to his pedal extremities on learning that the new puddling furnaces ... will be on duty the first part of next week.[29]

Further additions to the company's puddling and rolling capacity were made in the last years of the decade. In 1888-89 National Rolling Mill No. 4, with twenty single puddling furnaces, one 10-ton hammer, and one universal train of muck rolls, was built at the McKeesport site. Also, in 1889 twelve new puddling furnaces were added to National Rolling Mill No. 3. Iron production was brought to its peak in 1890 with the construction of the Boston Works. Established on a site approximately 3 miles up the Youghiogheny River, the mill held twenty single puddling furnaces and one universal train of muck rolls. With these additions, the company achieved a total annual capacity of 120,000 tons of skelp and charcoal iron by 1890.[30]

Yet even this immense tonnage was insufficient to meet the insatiable appetite of the company's pipe mills. As the additional puddling and rolling mills came on line, the company increased its pipe making capacity so that it was still necessary to purchase some skelp from outside suppliers. In 1886 a new butt mill, housed in a 400' x 132' building and containing six furnaces, was erected, replacing the one built in 1876. In 1887 the company added facilities for making large diameter lapweld pipe. The new mill was designed to make sizes up to twenty-four inches O.D. This put the company in a commanding position in the pipe business since no other pipe mill in the world could make pipe larger than fifteen inches. Two more lap weld furnaces were added in 1890, bringing the total to eleven to complement the six butt weld furnaces. These additions gave the company a capacity of 250,000 tons of pipe and boiler tubes in 1890.[31]

Another aspect of the company's drive for integration was its effort to secure a fuel supply. High volatile, gas coal was plentiful, and when transformed into producer gas it made a fine fuel for the numerous furnaces. However, the price and quality of coal varied. In 1885, to lessen its dependence on coal the company leased territory in nearby Murraysville, drilled its own

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[29] "New Puddling Furnaces," Daily News, October 29, 1886.

[30] American Iron and Steel Institute, Directory, 1890.

[31] Ibid.

natural gas wells, and piped the product to its McKeesport plants. The natural gas proved to be much cleaner than the producer gas, "making it much easier on the workmen who are compelled to watch the pipes while in the furnace."[32] By 1889 7.29 billion cubic feet of gas were delivered to the McKeesport plants annually, taking the place of nearly three hundred thousand tons of coal.[33]

The company then came up with an ingenious idea for using their producer gas plant to serve the town. A subsidiary, the McKeesport Gas Company, was organized, and a well-known chemist and inventor, W.F. McCarty, was employed to develop a process to scrub the dirty gas with steam. McCarty's patented process and the resultant product, water gas, pleased McKeesporters and attracted capitalists to the town from various cities to examine it.[34]

The final step in creating an integrated iron works came in 1890, when two blast furnaces and supporting facilities were built on the McKeesport site. Until this time, the iron was shipped by water to the plant from various furnaces in the Pittsburgh district. In 1889 the Monongahela Furnace Company, closely allied to the National Tube Company, was chartered with the purpose of supplying iron to the works. The new company leased the Edith Furnace, built in 1882 at Allegheny City, but apparently this was only a short term solution. Property adjacent to the McKeesport site was purchased, and Frank C. Roberts, a civil engineer from Philadelphia, was retained to design the furnaces. Construction began in August of 1889.[35]

On December 2, 1890 Mrs. E.C. Converse, wife of the General Manager of the Tube Works and the President of the Monongahela Furnace company, applied a lighted torch to a trail of pitch connected to Furnace "A". As the blaze "connected itself to the cord wood within the furnace, a mighty cheer went up from those assembled; the fires had been lighted under the finest blast furnace in the world," according to a Daily News reporter. Furnace "B" was blown-in on May 28, after an unnamed Allegheny

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[32]Daily News, January 14, 1885.

[33]Cushing, History of Allegheny County, 739.

[34]Daily News,"Will Pipe the Town," November 20, 1885; "Introducing Water Gas," Daily News, March 8, 1886.

[35]American Iron and Steel Institute, Directory 1890, 1892; "Beacon Lights," Daily News, December 2, 1890.

city maiden applied the flaming torch.[36]

The new blast furnace plant was hardly the "finest in the world" since it did not reflect recent advances in design. It was 80' tall by 20' in bosh diameter, so it was bigger than Edith, but it did not have lines like the furnaces at the nearby Edgar Thomson Works of Carnegie Steel Company, where expanded bosh diameters, as well as stronger blowing engines, were increasing output and transforming blast furnace practice. The seven Cowper stoves, 21' in diameter and 79' tall, as well as the thirty-two double-flue boilers and the blowing engines, were typical for the period. The furnace was charged by hand from wheelbarrows, hoisted four at a time to a bridge which spanned the stove and furnace tops. This system soon became outmoded with the introduction of the automatic skip hoisting system at Carnegie's Duquesne Works in 1895-97.[37]

By 1891, the National Tube Works had grown to a great iron empire. With 133 puddling furnaces and four rolling mills on three sites, it had an iron making and rolling capacity of 178,000 net tons, making it the largest producer of wrought iron in the Pittsburgh district. It had the most modern pipe mills in the country, and was the leading producer of iron pipe. Nine thousand men and boys were employed, just over 6,000 at the McKeesport plant. The McKeesport plant covered thirty acres. It included shops for the manufacture of everything used in production and was linked by eight miles of railroad.[38]

To better coordinate operations and increase the capital stock, the three allied concerns of the National Tube Works Company--the Monongahela Furnace Company, the Boston Iron and Steel Company, and the Republic Iron Works--were consolidated under a single management in 1891. The corporation's capital stock was increased from $3 million to $11.5 million. With the death of James C. Converse, his son E.W., general manager since 1890, became president. The corporation's headquarters remained

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[36]Ibid.; Daily News, May 28, 1890.

[37]Wm. Colquhoun, "Notes on the Iron and Steel Industries of the United States," Proceedings of the Iron and Steel Institute in American in 1890, (London, New York: E. & F. Spon, 1890): 231-254; Joel Sabadasz, "Duquesne Works: Overview History," unpublished manuscript, 1993.

[38]American Iron and Steel Institute, Directory, 1890, 1892; Daily News, Dec. 23, 1891; Cushing, History of Allegheny County, 735.

at Boston, Massachusetts. In addition to Eaton and French, another important Boston capitalist, banker David W. Hitchcock, came into the corporation as a director.[39]

Transition to Steel - 1880s-90s

In the early-1890s, an integrated iron mill was quite an anomaly in the Pittsburgh district. The 1880s and early-1890s saw the widespread dismantling of iron capacity and the changeover to steel. Jones and Laughlin, the second largest iron producer in the district, built two Bessemer converters in 1886.[40] The market for wrought iron products was waning. With his success in the 1880s, Carnegie had shown the way for the industry: steel was "the coming thing." It was a superior material for many products, especially rails and structurals, mainly because of its greater strength and resistance to both tensile and compressive stresses. Steel was also cheaper to make. Unlike wrought iron, which was made in "batches" by hand, steel was produced mechanically, either by Bessemer or open-hearth process. The laborious and time-consuming task of puddling was dispensed with, and the job of handling raw materials and hot metal was taken by the overhead traveling crane, rail car, and roller conveyor. Labor costs were cut dramatically since the veritable army of puddlers, knobblers, squeezers, and helpers employed in wrought iron production were unnecessary.[41]

The superiority of steel over wrought iron was not as evident in pipemaking. On account of its softness and ductility, fibrous structure, welding properties, and resistance to fatigue stress, wrought iron was well suited for making pipe. It was easier to thread than steel, and up until about 1910 thought to be more resistant to corrosion. Although charcoal steel had been used for some time in the manufacture of small diameter boiler tubes, there were technical problems, both in the making of a suitable, mild carbon steel and in the manufacturing process, that had to be solved before steel could replace wrought iron in

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[39] "J.C. Converse Dead," Daily News, May 25, 1891; "The National Tube Works," Iron Age 48 (September 10, 1891): 47; D. Hamilton Hurd, "David White Hitchcock," History of Middlesex County, Massachusetts, Vol. III (Philadelphia: J.W. Lewis & Co, 1890): 852-54.

[40] Hogan, Economic History of the Iron and Steel Industry, 299.

[41] David Brody, Steelworkers in America: The Nonunion Era (Cambridge: Harvard University Press, 1960): 1-50.

the pipe industry.[42]

In addition to the technical problems, another difficulty that pipemakers faced in making the transition to steel was the resistance of the labor force, particularly at National, where wrought iron production was integrated with pipemaking. Organized into powerful craft unions, wrought iron workers were prepared to resist any attempt by the company to introduce a technology that would eliminate or downgrade their jobs.[43]

Although National and the town of McKeesport would later become something of a citadel of nonunionism, labor unions were quite strong there in the 1880s and early 1890s. Both the Knights of Labor and the Amalgamated Association of Iron, Steel, and Tin Workers had lodges at National and at the adjacent Wood's Works. Until the great strike of 1894 and the conversion from wrought iron to steel, the unions, especially the Amalgamated, exercised a considerable sway over plant policies relating to wages and working conditions.

The Amalgamated had made its presence felt in McKeesport in the late-1870s, when a lodge was formed at the sheet mill at the Wood's Works. Trouble with management came in 1879, when the Amalgamated men tried to organize the non-union workers, refusing to work with them if they did not join. Woods closed the mill. He reopened it only after his employees withdrew from the Amalgamated and promised not to belong to any secret organization.[44]

A small Amalgamated lodge had developed at National by 1882, despite the fact that the managers of the company had a "aversion" for the union. It interfered with their prerogative to lower wages at any time in order to undercut competitors should the market waver. The company did not want its hands tied by "artificially high" wages or by work rules that stymied production. When the company refused to sign the Amalgamated scale in July, 1882, the lodge, composed of 175 rollers, struck and idled the entire plant for over a month. The company

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[42]Camp and Francis, The Making, Shaping and Treating of Steel, 324-25.

[43]See Brody, Steelworkers in America, Chapter III "The Breakdown of Craft Unionism," 50-79 for a full discussion of the role of craft unionism in the transition from iron to steel.

[44]"Sheet Mill Men now the Bone of Contention at Wood's," Daily News, March 17, 1887.

acquired a stock of several hundred stands of arms and tried to break the strike by importing strikebreakers. The union stood strong, and the effort failed. The strike was settled when the company agreed to pay the Amalgamated scale--without recognizing the union.[45]

The Wood's Works remained free of the Amalgamated until 1887, but the "Tube City" lodge at National became stronger. In January, 1885, after the company ordered a ten percent wage reduction in all departments, the puddlers "kicked very hard" and demanded a meeting with general manager Flagler. Flagler refused to budge, and the puddlers were forced to accept the reduction.[46] However, the puddlers redoubled their organization work for the Amalgamated. By July, 1885, the Amalgamated had enrolled all of the puddlers, rollers and their helpers--men paid "by the ton"--at the mill and was ready to confront Flagler with their demands.[47] At the same time, the Knights of Labor came to McKeesport and, in one great surge, organized National's pipe mill workers, as well as the coal miners, clerks, and salesmen in the vicinity.[48]

According to an prominent, unnamed "Amalgamated gentleman" interviewed by the McKeesport Daily News, the men at National had affiliated with both the Amalgamated and the Knights of Labor because "they find they can benefit themselves." Their main grievance was that Flagler had forced the puddlers to make six, rather than the traditional five, heats per turn. The extra labor "would break them down in a short time," he claimed. Flagler had also told the union men that he could not operate the mill under Amalgamated rules and threatened to bring in other men to do the work. The "Amalgamated gentleman" fully expected a

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[45]"The Strike," American Manufacturer and Iron World 31, No. 4 (July 28, 1882): 10.

[46]"Notice Posted, Daily News, January 12, 1885; "Puddlers Kick," Daily News, January 13, 1885; "Puddlers Strike," Daily News, January 14, 1885; "A Closed Meeting," Daily News, January 15, 1885.

[47]"Mill Men Organizing the Puddlers and Helpers of National Mill," Daily News, July 7, 1885.

[48]"New Knights to be Organized this Evening in Coates Hall," Daily News, April 17, 1885.

conflict.[49]

Flagler responded to the union challenge by suspending construction work on twenty-eight new puddling furnaces at National Rolling Mill No. 1 and announcing that the company would begin the manufacture of steel. After giving the order to convert No. 9 puddling furnace to a steel furnace, he explained:

> It was our intention to have introduced steel-making more or less in a limited way, and possibly not have changed our works over for two or three years. And, then it was our intention to educate our puddlers in the art of handling steel, so that their position would have been otherwise. ... Now, a few evil disposed minds in the mill creating demoralization among our peaceful men will have the effect on the company in expediting its plans to change the works to the manufacture of steel sooner than expected.[50]

Turning to the technical aspects of making steel for pipe, Flagler said that he had studied the problem for quite a while. The major difficulty was in the quality of steel: it was too full of flaws and foreign substances. Combining elements of the Bessemer and Clapp-Griffith processes, Flagler planned to develop his own steelmaking method. The goal was to produce a homogeneous, soft, and pliable steel from which butt or lap weld pipe of any size could be made and threaded.[51]

National's first attempt at steelmaking proved to be a failure, however, and Flagler capitulated to the Amalgamated. He reduced the number of heats back to the traditional five, and ordered a resumption of construction work on the puddling furnaces. He now expressed his full confidence in the men and their organization.[52] Without a strike, the Amalgamated had

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[49]"A Mill Man Refutes some Assertions of Mr. Flagler," Daily News, July 13, 1885.

[50]"Work Suspended on the New Puddling Furnaces, An Interview with Manager Flagler," Daily News, July 12, 1885.

[51]"Steel Gas Pipe, The Progress made in this Direction," Daily News, July 28, 1885; "Furnace, Mill, and Factory," The Engineering and Mining Journal 42, No. 5 (July 31, 1886): 81.

[52]"Resumed Work, The Furnaces at the National Mill to be Built," Daily News, July 30, 1885.

forced the company to abide by its work rules. Its triumph came, in part, because of the inability of the company to make its intended quick conversion to steel. The victory ushered in a union period that would last until 1894.

The Amalgamated continued to be a force at National, but the broader-based Knights of Labor exercised an even greater influence during the late-1880s. On March 18, 1886, led by a group of Swedes in the threading department, all National employees but a few clerks came out on strike. Despite the fact that the company was making money "by the bushel," the workmen had been denied a raise. The strikers particularly objected to the wage rate of $1.10 per day going to the lowest-paid. The strike leaders urged every man to join the McKeesport National Labor Union, affiliated with the Knights of Labor.[53]

At first Flagler was incensed, alleging that the men had broken faith with him. He laid out the hard line: "The National Tube Works can't be drove, never has been and never will be, and the men can stay out."[54] But the company had a large new pipe order, so Flagler soon became more conciliatory. On March 20 he addressed his employees. He reiterated his distaste for strikes, but nonetheless encouraged his men to organize: each mill in the country should have a "complete organization of all the departments." If there were difficulties, the men and their organization should first submit them to the managers of the mill. If such a "friendly conference" did not settle the problem, it should be placed before an impartial body for binding arbitration.[55]

On the following day, strikers appointed a committee to meet with Flagler. The committee included several "divines" from the city, who played leading roles in the talks. Rev. Boyle urged Flagler to make the golden rule, rather than the law of supply and demand, the "pivot point" of the talks. In the face of community pressure--and with the new pipe order--Flagler once

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[53]"On a Strike," Daily News, March 18, 1886; "Mad Mill Men," Daily News, March 19, 1886.

[54]Ibid., "On a Strike," March 18, 1886.

[55]"On a Strike," Daily News, March 18, 1886; "Mr. Flagler's Address," Daily News, March 20, 1886; "Almost Ended," Daily News, March 22, 1886. It is important to note that Flagler was not in favor of any sort of affiliation or collective action by National employees with any other organizations of mill workers in the country.

again capitulated. On March 23, he announced that the company would raise wages in all departments by 5 to 20 percent and would boost the basement wage rate to $1.25.[56]

The 1886 settlement heralded a period of relatively amicable relations between management and labor at National. Flagler pledged to abide by the golden rule: "Our creed is simple: No matter what nationality or creed, white or black, do unto others as you would be done by."[57] Both the Knights and the Amalgamated were "in full bloom," the Knights also gaining strength from coal miners of the region. The Amalgamated induced the company to participate in collective bargaining with iron workers. With the exception of the year, 1890, from 1887 to 1893 National signed the Amalgamated scale for its iron workers at the National Rolling Mills.[58] In fact, since the company employed the largest number of iron men in the country, it was seen as a leader in the Pittsburgh district negotiations. When disagreements over wages occurred between management and pipe workers, they were usually submitted to arbitration under Knights of Labor auspices.[59] In 1890 when the tube workers struck in protest of a reduction, E.C. Converse, who became manager in 1889 after Flagler resigned, opened the books to them, then financed a tour of investigation of other pipe mills by a workers' committee. After the committee found that National paid the highest wages of any of the mills, the workers docilely accepted the reduction.[60]

National continued its experiments with steelmaking, nonetheless. In October of 1886, the company announced the completion of a Siemens open hearth furnace with a capacity of 10

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[56]"End of Strike," <u>Daily News</u>, March 23, 1886.

[57]"The Golden Rule," <u>Daily News</u>, March 29, 1886.

[58]"Labor and Wages," <u>Engineering and Mining Journal</u> Vol. 45, No. 9 (March 3, 1888): 166; "Granted the Advance, Tube Works agrees to the Scale," <u>Daily News</u>, July 9, 1888; "Signed the Scale, National Tube Works signs Amalgamated Scale," <u>Daily News</u>, July 2, 1889; "Amalgamated Men visit McKeesport to Hold Meetings, <u>Daily News</u>, June 18, 1891; "Adjusted," <u>Daily News</u>, June 28, 1892; "Good News," <u>Daily News</u>, July 25, 1893.

[59]"Tube Wage Arbitration," <u>Daily News</u>, February 23, 1888; "A Roseate Hue Appears Today on Labor's Horizon," <u>Daily News</u>, May 26, 1888; "Happy Employees," <u>Daily News</u>, May 18, 1889.

[60] "A Proposition," <u>Daily News</u>, May 21, 1890; "Arbitration Committee Returns Home," <u>Daily News</u>, June 14, 1890.

tons.[61] In August of 1887, this furnace was torn-down and rebuilt. The new "monster furnace" had an enlarged capacity of 18 tons.[62] Despite the increased capacity, National continued to make only boiler tubes with its steel. Meanwhile, other pipe companies were experimenting with steel, and in 1887 the Riverside Iron Works of Wheeling (Benwood), West Virginia became the first manufacturer in the country to succeed in making welded steel pipe. The company landed a large pipeline contract with Standard Oil's National Transit Division, and soon thereafter abandoned its ironmaking plant and began manufacturing steel pipe exclusively. Riverside's success threatened to undermine National's leadership position in the pipe market.[63]

Riverside's success, the growing militancy of the Amalgamated and McKeesport's working class, and possibly the Homestead lockout of 1892, were factors that went into National's decision to do what Flagler threatened in 1885: change the works over to steel. As the influence of the Knights of Labor waned in McKeesport, some members of the working class, particularly the foreign-born, turned to a more radical philosophy--anarchism. By June of 1892 a well-organized order of anarchists had been established in the town. When Herr Johann Most, a member of the International Workingman's Association, editor of Freiheit, and one of the best known anarchists of the time, spent two days at the town, the Daily News sounded the alarm: "Anarchists!" There was a fear, no doubt shared by the managers of the mill, that the order would breed disrespect for law and order among the working men or even attempt to take over the town.[64]

Although the connection between the anarchists and the Amalgamated of McKeesport remains obscure, the latter had become

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[61]American Iron and Steel Institute, Directory, 1886; "Extensive Additions Being Made at the National Tube Works," Daily News, October 23, 1886.

[62]"An Immense Furnace," Daily News, August 4, 1887.

[63]Camp and Francis, The Making, Shaping and Treating of Steel, 1311; Hogan, Economic History of the Iron and Steel Industry, 276-77; "National Tube Company: World's Largest Maker of Tubular Products," US Steel News Vol. 2, No. 2 (February, 1937): 4.

[64]"Anarchists! The Order becoming Strongly Organized in McKeesport," Daily News, June 24, 1892. Herr Most was later interrogated for a possible connection with the Frick shooting, but was not arrested.

increasingly militant as the Homestead trouble loomed. The company renewed its contract with the Amalgamated on June 28, so there was no reason for the union men at McKeesport to strike on July 1, when the lockout at Homestead began.[65] But on July 7, the day after the "battle of the barges," a delegation headed for Homestead. According to the Pittsburgh Times:

> A delegation headed by George Boyton arrived from McKeesport about noon and informed a few gentlemen who were in the rooms occupied by the late Advisory Committee that the seven Amalgamated lodges of McKeesport were ready to send 2,000 well-armed men to the assistance of their brethren at Homestead, who would be ready to fight to the death, even against the National Guard.[66]

Apparently no assistance was asked, for there is no record of McKeesport men being involved in the ensuing events. They did, however, raise money for the locked-out Homestead men.[67]

Although the Amalgamated offered no trouble at National in 1892, the spectacle at Homestead--and the McKeesport men's offer of assistance--must have unsettled National's managers. After a meeting of stockholders, the company signed a contract with the Pittsburgh Iron & Steel Engineering Company for the construction of a Bessemer steel works on July 11, 1892.[68]

The purpose of the steel plant was to produce steel slabs to be used in making skelp for use in pipe manufacture. It was blown-in in November, 1893. Describing the plant, Iron Age judged it "typical of the state of the art" of the year in which it was built. Its design reflected the tendency toward quicker handling pioneered at Carnegie's Edgar Thomson Works. The system of car casting, vertical stripping, soaking pit furnaces, and electric traveling charging cranes developed at Edgar Thomson was used. The plant consisted of a converting house, holding two 8-ton vessels, and a cupola house with three cupolas. The capacity of the plant was 500 tons of steel every twenty-four hours. A 35" blooming mill, driven by Mackintosh, Hemphill & Co. engines,

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[65]"Adjusted! Daily News, June 28, 1892.

[66]Pittsburgh Times, July 7, 1892.

[67]"Another Big Meeting," Daily News, August 10, 1892.

[68]"An 1893 Bessemer Steel Works," The Iron Age 52 (November 16, 1893): 891-92.

was also built.[69]

National continued to make wrought iron pipe, however, until around 1910, but it soon ended its relationship with the Amalgamated. The company dealt with the iron workers' union until 1894, when it "had its Homestead." Had it not been for the Panic of 1893 and the resulting depression, the Amalgamated may have held out a little longer. The stagnation of trade forced the closure of the entire mill in August of 1893. The mill reopened in January, 1894, but only to those employees who would accept wage reductions that placed them at the same level as in 1885. Then, on May 23, 1894, after management refused a request for a plant-wide wage increase of twenty percent, the workers voted unanimously to strike. They threatened to "stay out all summer," or until their demands were met.[70]

<u>Labor Unrest of 1894</u>

In the nation, 1894 was marked by depression and widespread labor unrest. During the year, there were some 1400 strikes involving more than a half million workers. When National's 5,500 workers walked off the job in May, thousands of coal miners and coke workers, who had been on strike since April 21, were marching, rioting, and burning tipples nearby. According to the newspapers, many of the militant miners were foreign-born, who had been "duped" by anarchist and communist propaganda.[71] By this time, nearly 25 percent of the population of McKeesport was foreign-born. Large numbers of Hungarians, Polish, and other Eastern Europeans lived in quarters along the river just below the mill, and worked at National and other mills in the city.

The real trouble at National started on June 5, when there was an attempt to reopen the mill. After a series of meetings with the strikers' committee and a citizens' committee headed by the McKeesport Board of Trade, the company decided to reopen. Notices were posted to that effect, and in the morning 330 "old hands" appeared at the mill. An effort was made to start up two

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[69] Ibid.; "A Big Steel Plant," <u>Daily News</u>, July 16, 1892.

[70] "All Closed Down," <u>Daily News</u>, August 5, 1893; "National Tube Works to Open," <u>Daily News</u>, January 24, 1894; "Will Stay Out all Summer," <u>Pittsburgh Dispatch</u>, May 23, 1894.

[71] References to foreign miners being influenced by radical ideas start in October, 1885 in the <u>Daily News</u>; also "Wild Rioting at the National Tube Works," <u>Pittsburgh Dispatch</u>, emphasizes the role of foreign radicals, many of whom were coal miners, in the National strike.

lap weld furnaces. As soon as the strikers "heard the crack of the tubes," they gathered in great numbers outside the mill. When the "frenzied mob," led by a large number of the "foreign element" and joined by numerous striking coal miners, grew to five thousand at the end of the day, the company, fearful for their safety, arranged to feed and keep the "old hands" overnight. Despite its cache of arms left-over from the 1882 strike and a police force of thirty-two men, the company could hardly protect the workmen. The mill had no fence around it. Many of the townspeople sympathized with the strikers. Both company police and the city force of fifty men were completely cowed by the crowd.[72]

The violence started in the evening when a few of the "old hands" tried to make their escape from side exits at the mill. They were quickly seized and brutally beaten. When the mob learned of the encampment inside, they "rushed on to the company's property with a whoop and a howl and proceeded to clean out the place." They herded the workman into small groups, pushed them to the exits, and told them to run. Outside, they were forced to "run a fearful gauntlet" as clubs, stones, and fists were showered on them. Some were stabbed. A few were chased into shops and private homes. They were routed out, then beaten. The only workers to escape unharmed were five welders who seized a skiff and made their escape on the river. After the mob had dealt with the workmen, they turned their attention to the machinery and destroyed much of it.[73]

By 9 o'clock the violence had subsided. Although most of the workmen had simply been "badly used up," two lay near death. The mob continued to roam the city. A report was circulated that 200 deputies were arriving on the 10 o'clock train, so the strikers surrounded the B&O depot. When none appeared, the crowd dispersed. Meanwhile, the Board of Trade, Mayor James Andre, and Chief of Police Fehr met to discuss the situation. As a result, the Mayor issued a proclamation which ordered the crowd to disperse, established a 10:30 curfew, and directed the town's saloons to close immediately.[74]

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[72]"The Riots at McKeesport," The Iron Age 53 (June 14, 1894); 1140; "Wild Rioting at the National Tube Works," and "How the Riot Began," Pittsburgh Dispatch, June 6, 1894. Both the June 6 and June 7 issues of the Dispatch contain drawings illustrating the action at the mill and at the coal tipples.

[73]Ibid.

[74]Ibid.

On the following day, June 6, the company showed its defiance of the strikers by posting a notice stating that the mill would restart on June 7--with no wage increase. The men would report for duty or forfeit their jobs. Earlier, the company had contacted Sheriff Richards and asked for deputies, but fearing that the "Homestead riot would be worse than repeated," he refused to help. The company then appealed to the city of Pittsburgh for "sub-policeman" to help guard the works, but none were available because they had been called for deputy duty in the coke regions.[75]

The strikers remained defiant. They disregarded the mayor's proclamations and continued to occupy the town. They forced all of the other iron works in McKeesport--the Wood's Works, the Sterling Steel Works, and U.S. Iron and Tinplate Works--to close. Many of these workers joined the strikers. Although no leader had emerged, there was doubtless some coordination of effort, because the strikers divided into groups to guard different strategic points. Some remained at the mill, while others watched the railroad and depot for the arrival of strikebreakers. When reports were circulated that deputies would be arriving by barge, and that a cannon had been positioned across the river, strikers were posted along both sides of the river. The force was supplemented by "large numbers" of coal miners from the surrounding area, who came "marching" into town to lend their assistance. As afternoon approached, someone cried: "The coal tipples!" Led by 200 or 300 boys, a crowd of 3,000 rushed up the Youghiogheny to Port Vue and above, where two or three mines had been producinq coal for the National plant. They wrecked and burned two tipples, then forced the nonunion miners from the mines.[76]

After returning to town, it was decided that the next target would be the Duquesne Tube Works, which had been filling National's orders during the strike. Proceeding military-style in columns and armed with clubs, the crowd began moving towards Duquesne two and one-half miles away. After crossing the bridge at Riverton, a series of cries rose up from those in the lead, and the whole column broke into a run. They invaded the plant, which was in operation. The forty or so workmen there threw aside their tools and joined the crowd. Then the mob started for the coal mines in the hills behind Duquesne. Proceeding up Grant

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[75]Ibid.; "The Sheriff Won't Go," Pittsburgh Dispatch, June 6, 1894.

[76]"The Blazing Torch Again Does Work," Pittsburgh Dispatch, June 7, 1894.

Avenue and up the country road into the hills, they demolished and burned the tipples of two companies which had been supplying coal to National during the strike.[77]

On June 7, events began to quiet down. The company decided to abandon its plan to reopen the mill, so many of the workers returned to their homes, pleased that they had won a victory. Mayor Andre recruited some fifty volunteers to augment his police force, and Sheriff Richards came to McKeesport with a small force of deputies. The Sheriff's proclamation stating that the purpose of deputies was to protect property and preserve the peace--rather than reopen the mill--did much to quiet the situation.[78]

The strike continued without incident through June and early July. After Sterling Steel Works resumed operation during the first week of the month, 100 National workers returned to their jobs on July 11. The men were protected by the city police force and 16 detectives hired by the company from a Pittsburgh agency. Those who reported for work were mechanics--not production workers. Although a crowd of foreigners "hooted" at them as they filed into the plant, there was no violence. On the following day, the mechanics were joined by carpenters, bricklayers, threading floor men, boilermakers, and foundrymen, so that on July 12 over 200 were at work at National.[79]

On July 13, after the Wood's Works and the U.S. Iron and Tin Plate Works men went back to work, the General Committee of the strikers called a mass meeting in order to vote on whether to go back to work. The company had offered nothing new, only a promise to increase wages should business improve. On the following day, the strikers voted 2 to 1 to stay out. On July 15 tension mounted once again. A crowd of about 1,000 gathered at the main entrance of the mill and threatened the 250 men inside, but the arrival of the Sheriff with a force of over 100 averted trouble.[80]

The uneasy truce continued through July 18. Two hundred to

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[77] "Attack at Duquesne Works," Pittsburgh Dispatch, June 7, 1894.

[78] "The Sheriff in Charge," Pittsburgh Dispatch, June 8, 1894.

[79] "Break at the National," Pittsburgh Dispatch, July 11, 1894; "Tube Works Guarded," Pittsburgh Dispatch, July 12, 1894.

[80] "Strikers to Vote," Pittsburgh Dispatch, July 13, 1894; "Tube Workers Stay Out," Pittsburgh Dispatch, July 15, 1894.

300 men (mostly skilled workers) continued to work, protected by a growing force of deputies, and city and company police. With the strike now nearly two months old, many of the strikers were destitute and had lost their enthusiasm for the cause. Finally, on July 19 they voted to end the strike. It was a complete capitulation to the company. No wage increase was provided, and with the depressed conditions only about half were able to return to their jobs.[81]

The strike, along with the conversion to steel, brought results that were not unlike those at Homestead in 1892. Labor unions declined in power. The Knights of Labor, which had played such an important role in organizing the plant's unskilled and semiskilled workers, had already faded by 1894. The Amalgamated continued to maintain a presence at National until 1901, but it was too weak to act as a bargaining agent for the diminishing numbers of iron workers. Not until the 1930s would National's managers deal again with a labor union.

Another result of the strike was the transformation of McKeesport politics. In the 1880s the business community, the newspaper, and local "divines" had shown a great deal of sympathy for the workers and unionism. But the excesses of the strikers, the militancy of some of the foreign-born, and the threat of radical doctrines alarmed them and precipitated an adverse reaction. Symbolic of this change in the climate of opinion was the election of George H. Lysle to city council in the fall of 1894. Lysle, who would later serve as mayor of the city from 1913 until 1941, was rabidly anti-union. Under his influence McKeesport became the bastion of the fight against unionism, particularly during the 1919 strike and again during the Steel Workers Organizing Committee (SWOC) organizing campaigns of the late 1930s.[82]

Transition to Seamless Tubing - 1890s

As business conditions improved in the pipe business in 1895 and 1896, National initiated another program of expansion. In 1896 a subsidiary company, the National Galvanizing Works, was

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[81]"Tube Works Strike Ends," Pittsburgh Dispatch, July 19, 1894.

[82]The McKeesport Chamber of Commerce, McKeesport, Pennsylvania: The Tube City of the World and the Queen City of the Greater Pittsburgh District, (Philadelphia: Commercial Development Department, Philadelphia Company, 1926): 13; Hoerr, And the Wolf Finally Came, 172-73; McKeesport Bicentennial Committee, American Revolution Bicentennial, 1776-1976: A McKeesport Commemorative (1976): 169-71.

organized to built a galvanizing plant at Versailles, located up the Youghiogheny river between McKeesport and Boston.[83] In the same year, the company organized another subsidiary, the United States Seamless Tube Company, to build a plant at Christy Park, a small community on the Youghiogheny just above McKeesport. The purpose of this plant was to manufacture seamless steel tubing.[84]

Seamless tubing was "a coming thing" in the pipe industry because it eliminated the weakest part of the tube--the weld. National had long been a leader in developing new welding techniques. John Norton, a mill foreman, and George Matheson, superintendent, had invented and patented the butt-weld bell in 1876. In 1889 Norton invented a welding ball that was used in making large diameter lap-weld pipe.[85] In the late-1880s, National began experiments with electric welding. Utilizing a technique developed in Lynn, Massachusetts, National produced its first electric-weld, steel pipe in 1889.[86] However, National was not the first American company to make seamless tubes: that distinction belongs to the Ellwood City Works in Ellwood City, Pennsylvania, which accomplished the feat in 1895.[87]

The seamless plant at Christy Park was completed in 1897. The plant employed between 300 and 400 men. Although it was expected that a large part of the operations of the plant would be devoted to producing bicycle tubes (light structural members) by piercing, the plant's main product was steel cylinders for

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[83]"Manufacturing: Iron and Steel," The Iron Age 57 (June 18, 1896): 1427.

[84]J. Perc Boore, The Seamless Story: A History of the Seamless Tube Industry in the United States (Los Angeles: The Commonwealth Press, Inc., 1951): 154.

[85]"Successful Test of Another McKeesport Invention," Daily News, March 20, 1889. Norton, along with another National employee, Robert Tate, invented a process by which wrought iron could be made directly from ore in the blast furnace using a receiver to give it a "second body." Pittsburgh district capitalists were not interested in the process, so Tate and Norton sold it to two iron men in Lawrence county, Tennessee; "Taken to Tennessee," Daily News, July 14, 1885.

[86]"Welding by Electricity," Daily News, July 14, 1888; "Electric Welding Introduced by National Tube Works," Daily News, November 18, 1889.

[87]Camp, The Making, Shaping and Treating of Steel, 1328.

holding gas, made by a process called cupping. In the cupping process, circular plates of varying thickness are pressed or stamped cup-shape and, by repeated stamping, the cup is deepened and reduced in diameter until it assumes the shape of a cylinder. This process is useful for making shells, and in March, 1898, the company received a large order for projectiles to be used in the Spanish-American War. A piercing mill designed by Mr. E.F. Holinger was installed in 1898.[88]

Turn of the Century Consolidation in the Iron and Steel Industry

The trend to consolidation in the iron and steel industry began in the 1890s and accelerated after the recovery following the Panic of 1893. The major factor in initiating the merger movement was the lack of stability in the market caused by severe competition and overproduction.[89] In addition to stabilizing production, consolidation had a host of other benefits, described below by Charles R. Flint of New York:

> The following are the principal ones: Raw material bought in large quantities is secured at a lower price; the best quality of goods is produced; the specialization of manufacture on a large scale in separate plants permits the fullest utilization of special machinery and processes, thus decreasing cost; the standard of quality is raised and fixed, the number of styles is reduced, and the best standards adopted; those plants which are best equipped and most advantageously situated are run continuously and in preference to those less favored; in case of local strikes or fires the work goes on elsewhere in such a way as to prevent serious loss; a better force of salesmen takes the place of a large number; terms and conditions of sale become more uniform; the aggregate of stocks carried is greatly reduced, thus saving interest, insurance, storage and shop wear; greater skill in management accrues to the benefit of the whole instead of a part, and large advantages are realized from comparative accounting and comparative

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[88]Boore, The Seamless Story, 157-59. In 1908 the name of the United States Seamless Tube Company was dropped and the plant became know as the Christy Park Works. The plant manufactured shells and bombs for Allied use in World Wars I and II.

[89]Hogan, Economic History of the Iron and Steel Industry, Vol. 1, 235-37.

administration.[90]

Although the National Tube Works Company was the leading pipe and tube producer in the nation, it had a number of competitors. The Riverside Iron Works was the next largest producer, while the Reading Iron Company was third. Altogether, there were more than thirty companies engaged in the manufacture of pipe and tubes in 1899. In that year, a syndicate connected with financier J.P. Morgan and Company decided to merge many of these into a single unit. Vice-President of the National Tube Works Company Edward C. Converse, and counsel, William N. Cromwell, undertook the task of acquiring twenty-five producers of pipe and tubes in order to form the new organization, the National Tube Company. However, only the following joined the new combination:

National Tube Works Co.	McKeesport, Pennsylvania
	Pittsburgh, Pennsylvania
Riverside Iron Works	Wheeling, West Virginia
Pennsylvania Tube Works	Pittsburgh
American Tube & Iron Co.	Middletown, Pennsylvania
	Youngstown, Ohio
Ohio Tube Co.	Warren, Ohio
National Galvanizing Works	Versailles, Pennsylvania
Oil Well Supply Co. (Continental Tube Works & Elba Works)	Pittsburgh
Oil City Tube Co.	Oil City, Pennsylvania
Morris, Tasker & Co.	New Castle, Pennsylvania
Allison Manufacturing Co.	Philadelphia, Pennsylvania
Chester Pipe and Tube Co.	Chester, Pennsylvania
Syracuse Tube Co.	Syracuse, New York
Cohoes Tube Works	Cohoes, New York
Western Tube Co	Kewanee, Illinois

With an aggregate capacity of more than 1.1 million tons per year, National Tube Company had approximately 75 percent of the pipe and tube capacity of the country. It controlled a large share of the domestic market, as well as supplied pipe for the oil fields of Russia, Bulgaria, Java and Canada, and made hydraulic equipment used in mines and industrial works around the world. The company manufactured pipe from one-tenth of an inch to thirty-six inches in diameter. It made all grades of steam, gas and water pipes, boiler tubes, oil and artesian well tubes, electric conduits, trolley poles, shells, projectiles, hand

[90] "Industrial Consolidations," An Address by Charles R. Flint of New York, The Iron Age 63 (June 1,1899): 101.

rails, and other varieties of pipe.[91]

The National Tube Company had nearly two years of independent existence, July 1, 1899 to April 1, 1901. The company was immensely successful: In the first full year it earned $14,600,000.[92] But its very success challenged the greatest steel man of the age, Andrew Carnegie.

The clash with Carnegie came after the company made the decision to build additional basic iron and steelmaking facilities at its Riverside Works at Wheeling, West Virginia in order to supply more of its steel requirements. Only the Riverside and McKeesport plants were integrated works; the company purchased most of its steel from Carnegie. Carnegie was concerned because the new plant would mean the loss of a large market. In retaliation, his company announced in late-1900 that it would build a tube plant at Conneaut Harbor on Lake Erie. The plant would have a capacity of 280,000 tons per year and make seamless tubes. This would be a serious challenge to National Tube's supremacy in the market.[93] A concerned President E.C. Converse said:

> In all of the arrangements between the National Steel, Republic, American Sheet Steel, Tin Plate and others of the industrial steel groups, it has been the unwritten law that each group should confine itself to the fabrication of its own specialties and should voluntarily refrain from using constant surplus of material for the production of a special product of its neighbor. If this unwritten law is to be ruthlessly disregarded by the Carnegie Company, it will of course have a broader significance than the mere competition with our own product.[94]

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[91]"The Tube Consolidation," The Iron Age 63 (June 1, 1899): 18; "National Tube Co. Organized," The Iron Trade Review 32, No. 22 (July 20, 1899): 10; Hogan, Economic History of the Iron and Steel Industry, Vol. 1: 275-81.

[92]Hogan, Economic History of the Iron and Steel Industry, Vol. 1: 280.

[93]Ibid., Vol. 2: 465.

[94]National Tube Company, unpublished minutes, January 1901 meeting, quoted in Hogan, Economic History of the Iron and Steel Industry, Vol. 2: 465-66.

Carnegie was unconcerned about such an unwritten law, declaring that:

> The policy of the Carnegie Company is to cooperate in every way with its fellow manufacturers in the industrial world, and not to push itself into any new field save in self-defense. We did not leave the National Tube Company. They left us, which they had a perfect right to do, of course.[95]

Although Converse and others thought Carnegie was bluffing, many in the industry, including Morgan, did not. Morgan feared that the new tube mill would bring a "demoralization" of the price of tubes, and thereby destroy his favorite child, the National Tube Company. Morgan wanted Carnegie to stay out of the tube business, so he resolved to buy Carnegie Steel. To discuss the issue, a gathering of financiers and steel men, with Morgan and Charles Schwab, president of Carnegie Steel, as the featured guests, was arranged in New York City on December 12, 1900. At this famous "Simmons dinner" Morgan began the process of bargaining with Schwab that would eventually lead to the creation of US Steel.[96]

Thus, the National Tube Company played an important role in the elimination of Carnegie as a threat in the market and the creation of US Steel. In April, 1901 the company found itself a part of a gigantic $1.4 billion corporation.[97] Although former National employees are fond of relating how independent the subsidiary was under US Steel, the company was, in fact, only a small player in "The Steel Corporation." Gone were the years of independence and technological ingenuity which marked the company's initial period of development.

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[95]John K. Winkler, Incredible Carnegie (New York: Vanguard Press, 1931): 264, quoted in Hogan, Economic History of the Iron and Steel Industry, Vol. 2: 466.

[96]Hogan, Economic History of the Iron and Steel Industry, Vol. 2: 467-73; Joseph Frazier Wall, Andrew Carnegie (Pittsburgh: University of Pittsburgh Press, 1989): 781-85.

[97]At this time the W. Dewees Wood Company, the adjacent "Woods Works," was acquired by the American Sheet and Tin Plate Company, a subsidiary of US Steel. It remained under this subsidiary until 1956, when the property was acquired by the National Works.

Expansion under US Steel - 1906-09

Belonging to an organization with such an immense capital stock did bring tangible benefits. In 1902 the Finance Committee of US Steel announced a 5 million dollar expansion and improvement program for the McKeesport plant, now known as the National Works of the National Tube Company. The program involved practically the rebuilding of the whole works and the construction of a new tube and pipe mill. Initially, there were problems acquiring a tract of land adjacent to the existing works upon which to build the pipe mill. The 76 landowners of "the old Bowery district" wanted more from their property than US Steel was willing to pay. After the corporation threatened to build a pipe mill at another site, a group of McKeesport boosters purchased the property themselves and offered it to the corporation at a reduced price. By 1903 the National Tube Company had title to the 28 acres running from Center Street westward to Virgin Street.[98]

The centerpiece of the program was the new tube and pipe mill. Construction began in early 1906. A November 8, 1906 Iron Age article described the ongoing work:

> ... in a short time the tube and pipe mill department will began the erection of what, it is said, will be the largest mill building in the world, covering more than 20 acres of floor space, nearly every square foot of which will be served by an overhead electric traveling crane. This building, or series of buildings forming one, will be constructed of steel and brick, and will extend without a break in the roof covering, and will be 567 ft. wide. One portion, nearly a third of a mile long, will be covered by roof trusses spanning 158 ft. and at their centers carrying crane runways for 15-ton traveling cranes. The pipe welding furnaces and machinery for the production of sizes from 1/8 in. to 36 in. diameter will be located in this portion of the building, while the balance of the space will be used for cooling tables, finishing and testing equipment and for stocking. The skelp will be handled directly from cars, and this operation, together with successive ones of charging, scarfing, bending, welding, sizing, straightening, cooling, stocking and shipping, will be accomplished by the use of the most modern machinery and labor saving devices, all operated

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[98] "A New Tube Mill at McKeesport," The Iron Age 69 (June 26, 1902): 43; "Proposed Tube Mills at McKeesport," The Iron Age (July 24, 1902): 40.

> by electric motors deriving their power from the central electric power house above described. Large areas have been reserved for stocking pipe for all sizes under cover.
>
> In the pipe mills, as elsewhere in the plant, arrangements are being made to minimize the exposure of workmen to heat and danger by placing the controlling levers and devices as far as possible from hot and dangerous machinery. Great attention has been given to the question of light and ventilation. The best possible arrangements for lighting the large building has [sic] been aimed at and entirely satisfactory results are expected. Fresh air will be taken from outside the building and blown directly on the men exposed to great heat, and large heating and ventilating systems have been installed for those parts of the building remote from the hot furnaces and pipe, so that it is expected that at all times as pure air and as comfortable a temperature will be maintained in such a large structure.[99]

By the following year the main pipe mill was completed. The building housed twelve lap-weld mills and six butt-weld mills, and produced tubes in diameters from 1/8" to 30" in lengths up to 40'.

The main pipe mill was only one part of the construction program, which continued until 1909. Every department in the works was either rebuilt or improved. The blast furnace plant, outmoded soon after it was built in 1891, was expanded and modernized. In 1907 blast furnaces "A" and "B" were rebuilt and a third and fourth blast furnace added. Denoted "C" & "D", the new furnaces were 90' high with a 22' bosh diameter. Eight Massicks & Crooke hot blast stoves, each 95' high x 22' diameter were also built. A new blowing engine house, equipped with nine vertical, cross-compound, steam blowing engines (three Allis-Chalmers and six Southwark) was included. To facilitate the delivery of raw materials to the furnaces, a new ore bridge and a Hulett moving car ore dumper were installed. A Uehling pig casting machine was provided, but most of the product was conveyed in molten state to the metal mixer, then to the Bessemer converters. The annual production in 1908 was 650,000 tons of pig iron. Gas cleaning facilities, including a Dorr thickener,

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[99] "The National Tube Company's McKeesport Extensions," The Iron Age (November 8, 1906): 1244-245.

were soon added.[100]

Perhaps the most radical modifications of the works involved the rolling mills. They were completely rebuilt, and four new steel frame, steel-clad buildings were constructed to house the skelp mills. The 35" blooming and slabbing mill, built in 1893, was discarded in 1904 when a Mesta 40" universal slabbing mill of the two-high reversing type was installed. The new mill was termed "unique" and "novel" in a September 29, 1904 Iron Age article because it had only two, rather than three or four, vertical rolls. The blooming mill building was extended, and soon thereafter a second blooming and slabbing mill of the same make was added and placed on a parallel line. Both mills were steam-driven and included Mackintosh, Hemphill & Co. shears.[101]

To transform the semi-finished steel blooms and slabs into skelp, four skelp mills were built: a 110" plate mill, a 42" universal mill, a 16" mill, and a 13" mill. The 110" plate mill was a three-high, 34" x 110", reversing mill manufactured by Mackintosh, Hemphill & Company. The mill was driven by a 38" & 70" x 60" horizontal, tandem, compound, condensing Brown-Corliss steam engine with a fly-ball governor. Other original equipment consisted of a guillotine type, electrically-driven hydraulic shear manufactured by R. D. Wood Company for cutting plate lengthwise; a knife-type, electrically-driven rotary trim shear manufactured by R. S. Newbold & Sons for trimming edges; a nine roll, electrically-driven, R. S. Newbold straightening machine; and electrically-driven transfer tables.

The 42" mill was a three-high universal reversing mill manufactured by A. Garrison Foundry Company, with electric motor-driven screwdowns. A guillotine-type, hydraulic shear built by the National Tube Company, and a nine roll, electric motor-driven straightener made by Hilles & Jones Company were also included as original equipment. All of the conveyor tables were electric

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[100]"The National Tube Company's McKeesport Extensions," The Iron Age (November 8, 1906): 1244-245; American Iron and Steel Institute, Directory, 1908; "General Description of Physical Condition of National Works," National Tube Company, November, 1938; USX Corporation, National-Duquesne Works, National Plant, Surplus Equipment Inventory, ca. 1984. The two latter works are unpublished and available only at National Works office and map room.

[101]"The Mesta 40" Slabbing Mill," The Iron Age 74 (September 29, 1904): 1-3, 4-5; "New Blooming Mill Contract," The Iron Age 82 (August 20, 1908): 529.

motor driven. The main power source was a 35" & 62" x 54" steam engine, a horizontal, tandem, compound, condensing type manufactured by Southwark Foundry and Machine Company.

The 16" mill was a two-high continuous mill built by Mesta Machine Company. The mill was arranged in three groups of three passes each, with one bull-head pass. The roughing stands were powered by a 38" & 70" x 60" horizontal, tandem, compound, condensing steam engine manufactured by Brown-Corliss. The finishing stands were powered by a 24" & 44" x 48" horizontal, tandem, compound, condensing engine manufactured by Brown-Corliss. The 16" mill included electrically-driven transfer tables, a flying shear and two cupping and clipping shears.

The 13" mill was a two-high continuous mill with eight stands, also built by Mesta Machine Company. Included were transfer tables, an edging shear, and an hydraulic shear manufactured by Garrison. The roughing stands were driven by a 24" & 44" x 48" Brown-Corliss, horizontal, tandem, compound, condensing steam engine with a fly-ball governor. The finishing stands were driven by a 30" & 54" x 60" Allis-Chalmers horizontal, tandem, compound, condensing steam engine with fly-ball governor.[102]

A host of ancillary buildings and shops were also built at this time. The roll shop, for turning and dressing rolls, was built in 1905, as was the coal hoist, which could lift, crush, and dispense 2,000 tons of coal in ten hours from barges. The power house (for generating electrical current), the blacksmith shop, oil house, the riggers' building, the machine shop and pattern storage building, the stores building (for storing light goods and dispensing the payroll) and McKeesport Connecting Railroad roundhouse, were built in 1906. The foundry, which included facilities to melt and pour iron, brass, babbitt, and tin, was built in 1908. The main office building, a stylish brick structure built in 1876, was enlarged in 1907. In 1908 the carpenter shop and boiler (or structural) shop were built. This flurry of construction activity was concluded in 1909, when the coupling tap building, for threading couplings and housing testing equipment, was built.[103]

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[102]National Tube Company, National Works, Skelp Mills (Pittsburgh, Geo. H. Alexander & Co., Inc, 1911); this volume is available at the map room at McKeesport.

[103]"The National Tube Company's McKeesport Extensions," The Iron Age, (November 8, 1906): 1244-245; information about these

Internal transportation was not ignored in the rebuilding of the works. In addition to the construction of the roundhouse, extensions and improvements were made in the lines and stock of the McKeesport Connecting Railroad. This in-plant railroad transported raw, semi-finished, and finished materials between plant departments. With 6.05 miles of line and 22.66 acres of yards and facilities, the McKeesport Connecting linked the works to the Pennsylvania, Pittsburgh and Lake Erie, and Baltimore & Ohio railroads. To facilitate the movement of coal and other goods between different departments, a plant-wide telpher or narrow-gauge tram road, powered by electric locomotives, was built.[104]

Despite the fact that the rolling mills had some "unique" features, the rebuilding project put into place facilities that were merely typical for the period. There were no innovative technologies. While many pipe works were adopting the piercing process to make seamless pipe, National continued to use the old lap- and butt-weld techniques which were developed in the 1870s and 1880s. Nonetheless, a June 18, 1931 Iron Age article highlighted the fact that the main pipe mill was equipped with conveyors with "live rollers" (electrically driven) to move pipe across the shop between operating units or processes, thus increasing the productivity and flexibility of the mill and limiting the use of cranes in moving the product. According to the article: "This method of handling pipe was developed by the National Tube Company about 15 years ago, and has proved most advantageous."[105] However, another source declares that this continuous flow system was, in fact, put into place at the National Works in 1897.[106]

The most noteworthy aspect of the new facilities was architectural, rather than technological. Unlike the purely utilitarian steel-shed facilities that would characterize mill architecture in the twentieth century, most of National's new buildings were constructed of steel frame and brick. They were finely styled and detailed. Coming before the era of electric lighting, the buildings featured handsome fenestration. The main

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facilities was also obtained from original drawings at the McKeesport map room.

[104]Ibid.

[105]Sidney G. Koon, "Seamless Tube Mills at McKeesport," The Iron Age 127 (June 18, 1931): 1962-966, 2008.

[106]"History of the Tube Works in 50 Years," Daily News.

pipe mill, in particular, was an architectural wonder. It was widely acclaimed for its size. At 1548'x 567', it enclosed an area in excess of 20 acres. A 1911 Iron Age article related that it was "the largest building under one continuous roof in the world." One bay was covered by roof trusses spanning 158' at their centers and carrying crane runways for 15-ton traveling cranes.[107]

Competition and Modernization in the 1920s

Although the McKeesport plant continued to be a large producer of pipe, it lost its place as the production leader in the industry in the 1920s. Competition came not only from independents such as Youngstown Sheet & Tube Company, but also from other plants within the National Tube Company. As the extensive improvements were being made at McKeesport in the 1900s, US Steel made larger investments in pipemaking at Gary, Indiana and Lorain, Ohio. Located on Lake Erie near the proposed site of Carnegie's tube mill, Lorain was only a small steel company before 1904, when it was incorporated into the National Tube Company. After an extensive expansion program in the 1900s, its tube production was raised so that it surpassed that of the McKeesport plant by 1928. In this year, the McKeesport plant ranked third in pipe production behind Youngstown Sheet & Tube Co. and the Lorain Works.[108]

In 1928 US Steel announced a $25 million modernization program for the National Tube Company. Much of the investment was earmarked for the National Works to provide facilities for the manufacture of seamless pipe and for a new steel plant. The seamless mills were designed to fill the demand for oil country goods, such as casing and drill pipe. Seamless pipe was replacing lap-weld in the oil industry because it afforded greater resistance to the pressures of the deep wells that were being drilled. Furthermore, seamless had a lower cost of production, $7 to $14 a ton cheaper to produce than lap weld.[109]

In June of 1929 work was started on the improvements. The main pipe mill was enlarged with the construction of a billet storage bay on the north side and annexes on the south side. The

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[107]"Excursions, Engineering, and Otherwise: National Tube Company," The Iron Age 87 (June 8, 1911): 1416.

[108]"Location, Number, Capacity and Range of Pipe Mills in United States by Companies," Blast Furnace and Steel Plant Vol. 16, No. 5 (May, 1928): 634.

[109]Hogan, Economic History of the Iron and Steel Industry, Vol 3: 891.

two seamless mills would replace the ten lapweld mills. The well-tested Mannesmann double-piercing process was adopted. The machinery for the installation was manufactured by Aetna Standard Engineering of Pittsburgh. The capacity of Seamless No. 1 mill was rated at 100,000 tons; No. 2 mill was rated at 150,000 tons.[110]

In 1930 work began on the new steel plant. The new plant consisted of three 25-ton Bessemer converters, two 800-ton hot metal mixers and three 250-ton open hearth furnaces. Wind for the Bessemers was provided by three General Electric centrifugal blowers direct-driven by steam turbines. Built by Pennsylvania Engineering Works of New Castle, Pennsylvania, this plant was designed for use either as a straight open-hearth plant, or for duplex operation, in which the partly blown metal from the converters was finished in the open-hearth furnaces. In practice, it was used almost exclusively in the duplex process. Each of the open-hearth furnaces was equipped with Connolly waste-heat boilers, which generated enough high-pressure steam to run the turbo-blowers for the Bessemers.[111]

To make rounds for the seamless mills, a 32" bar mill of the reversing type was installed in 1930. Manufactured by Mesta, the mill was driven by a 3000 hp Westinghouse electric motor. A hot saw line with two rotary-type saws also was installed, along with pickling vats, three billet peelers and facilities for scarfing and inspection. At the same time, the Mesta 40" slabbing mill was converted from a universal slabber to a straight two-high blooming mill; and, to tie the conveyor lines of the blooming mills with the bar mill, a turntable was installed.[112]

Labor in the Early 20th Century

For the most part, labor was acquiescent at McKeesport during the 1901 to late-1930s period. The 1919 steel strike idled the National Works for a week, but this was more a precautionary measure taken by the company than an initiative of labor. The Daily News reported in its special edition, "Half Century of Progress," on June 30, 1934 that "there is no

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[110] "New Pipe Mills at McKeesport Works of National Tube Company," The Iron Age, Vol 127, No. 19 (May 7, 1931): 1502-06; "Seamless Tube Mills at McKeesport," The Iron Age, Vol 127, No. 25 (June 18, 1931): 1962-66.

[111] "New Steel-Making Equipment at National Tube Co. Works," The Iron Age 127 (May 7, 1931): 1502-07.

[112] Ibid.

industrial city in the United States which possesses a more stable and more capable group of industrial workers than McKeesport."[113] The National Tube Company was the largest employer in the town with 7,200, while the National Sheet Tin & Plate Company employed 1,800, Firth Sterling Steel Company 550, and Fort Pitt Casting Company 300. A considerable number of the mill workers were immigrants or the children of immigrants from eastern Europe. Of McKeesport's total population of 54,632 in 1930, the foreign-born and those of native birth and foreign (or mixed) parentage numbered 32,154, or 58 percent of the total.[114]

While McKeesport's foreign-born were noted for their militancy during the 1894 strike, by the 1920s they were considered a source of stability in the mills and the community. One commentator writing in 1926 advanced the theory that the foreign-born had created no "social problem" because the "nationalities readily respond to the Americanization movement as witnessed by the numbers becoming naturalized yearly."[115] A more in-depth study in 1937 placed great importance on the fact that there was a high percentage of home ownership among the foreign-born. It was estimated that 70 percent of the Slovaks, the largest immigrant group, owned their own homes by this time.[116]

Although workers' acquiescence during this period can be attributed in part to the assimilation of the foreign-born into the community and their acceptance of American values, the most important factors were the repressive policies of the company and the town. After 1894 the National Tube Company pursued a policy that was unrelentingly opposed to unions. According to Phil McGuigan, a National Tube employee, the company employed detectives to spy on its men to forestall organizing activities.[117] During George Lysle's reign as mayor from 1913 to 1941, the city was off-limits to union organizers. During the 1919 strike, Lysle refused permits for meetings and had union organizers arrested at the railroad stations. Lysle was an

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[113]Quoted in Mary E. Hurlbutt, New Americans in Allegheny County (Columbia University Press: New York, 1937): 79.

[114]Ibid., 77, 79.

[115]McKeesport Chamber of Commerce, McKeesport, Pennsylvania, 41.

[116]Hurlbutt, New Americans in Allegheny County, 80.

[117]McKeesport Oral History Project, Crashin' Out: Hard Times in McKeesport, "Interview with Phil McGuigan," 11.

outspoken enemy of communism, so in 1934 when hundreds came to McKeesport, he ordered them out of town. In June, 1936, when SWOC brought 150 organizers into the town to initiate its Pittsburgh district drive, Lyle refused them a meeting place. The organizers were forced to borrow a coal truck and use it as a platform for the speakers.[118] Despite Lysle's tactics, the National Works was organized in 1937 by SWOC after Myron Taylor of US Steel signed an agreement with the union.[119]

National Tube in the Mid-20th Century

There were few changes in the National Plant during the 1940s. Unlike US Steel's other Mon Valley plants, the National Works reaped little benefit from the massive investment program of the Defense Plant Corporation during World War II. While the Christy Park plant obtained a $25 million contract to manufacture airplane bombs from seamless pipe, apparently the only defense-related activity at National was research. In 1945 a small annex was built adjacent to the 42" mill which served as the Rocket Research and Development Plant Supervisor's Office. The historical record is still silent as to what type of work went on here.[120]

In 1944 a serrated bell was installed on National's No. 1 blast furnace. The purpose of the bell was to more evenly distribute the ore into the furnace during charging. According to a 1947 article, this was the first installation of such an apparatus.[121] By 1953, Blast Furnaces Nos. 2 and 3 also had serrated bells. Another improvement undertaken in this decade was the installation of a sintering plant in 1949.[122]

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[118]American Revolution Bicentennial, 1776-1976: A McKeesport Commemorative, 169-70.

[119]Hogan, Economic History of the Iron and Steel Industry, Vol. 3: 1173-78.

[120]"National Tube Co. Gets $25,000,000 Federal Award," The Iron Age, 146 (August 1, 1940): 82; National Tube Company, "Rocket Research and Development Plant, Shop Superintendent's Office," Drawing #3633, April 28, 1945, available at the McKeesport map room.

[121]Truman H. Kennedy, "Blast Furnace Bell Development," American Iron and Steel Institute Yearbook (1947): 113-24.

[122]E.O. Austermiller and W.A. Cureton, "Design and Operation of National Tube's Sintering Plant," Iron and Steel Engineer Vol 28, No. 10 (October, 1951): 111-19.

In 1950 a two-step blast furnace plant modernization program was initiated that included the construction of a high-pressure boiler house and the installation of two topping turboblowers in the blowing room. A split-wind setup, by which the two turboblowers could be used to provide air for any number and combination of blast furnaces, as well as the Bessemer converters, was installed in 1954.[123]

Prior to the construction of the central boiler house in 1950, there were six-small capacity boiler plants located throughout the plant. In addition, there were waste heat recovery boilers at the open-hearth facility and a low pressure power station adjacent to the bar and bloom mill. The low pressure power station received considerable attention when it was built in 1910. Iron Age called it a "unique" and "important low pressure installation." It was based on the design of Professor Auguste C.E. Rateau, an innovative French steam engineer who in 1902 put the first installation of this type into service at Mine de Bruay, France. The installation used only exhaust steam from the two non-condensing engines at the blooming mill and from one Bessemer blowing engine. After doing its work, exhaust steam from the three engines was conveyed to three steam regenerators or accumulators, where it was stored and then conveyed to a 3000 kw Curtis turbo-generator. It produced three-phase, 25 cycle AC 6600 volt current.[124]

With the construction of the central boiler plant in 1950, steam generating facilities were centralized. The new boiler plant had five boilers and a Cochran hot process water-softening plant for treating boiler feedwater. The reaction tanks of the water-softening plant were purportedly the largest in the world when the plant was built. The entire works was tied together with asbestos-lined steam piping, and with the exception of the turbo-blowers (which operated at 850 psi), the works received 150 psi of steam.[125]

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[123] E.O. Austermiller and W.A. Smith, "The Installation of, and Split Wind Blowing with, Topping Turboblowers for Blast Furnaces." Iron and Steel Engineer Vol 33 No 9 (September, 1956): 173-9.

[124] "A 3000 KW Turbo Alternator: An Important Low Pressure Installation at McKeesport, Pa." The Iron Age 85 (May 26, 1910): 1240.

[125] "Boiler House to be Built at McKeesport," Blast Furnace and Steel Plant Vol 38, No. 4 (April, 1950): 463; "Interview of Philip Krepps," July 7, 1989 by author. Mr. Krepps was Turn

The rapid growth of the pipeline market in the 1940s led US Steel to consider further expansion of its butt-weld capabilities at National. The manufacture of butt-weld pipe had been discontinued in 1936, replaced by the two seamless lines. The skelp mills were shut down, and all butt-weld facilities were moved to the Lorain Works during World War II. While seamless was far superior to butt-weld for oil country goods, butt-weld was still valuable in other applications, especially for natural gas and petroleum-product transmission lines where great strength was not required. In 1950, a new butt-weld mill for making pipe in diameters of 26" to 36" was installed in the main pipe mill which used the submerged arc welding (SAW) process. This process was originally developed by the National Tube Company at its Christy Park plant.[126]

In 1951 the National Tube Company was reorganized and made a part of the National Tube Division of US Steel. The purpose of this move was to bring all of US Steel's tube making plants under one management. The first act of the division at National was to make improvements in facilities that produced oil country tubular products. As wells were drilled deeper, demand rose for even stronger oil well pipe and casing. To meet this demand, National began heat-treating certain lines of its seamless tubing in the 1950s. In 1951 a warm working line was installed, and in 1955 the No. 1 quench and temper line was added, both in the main pipe mill. These were to be the last major changes in the main pipe mill.[127]

Foreman and Assistant Superintendent of Shops and Utilities at National Works from 1950 to 1982.

[126]"First Pipe Leaves New Twin Mills," The Iron Age 165 (April 13, 1950): 102-03; "New Pipe Mill at McKeesport in Operation," Blast Furnace and Steel Plant Vol. 38, No. 5 (May, 1950): 582; "Electrical Weld Tube Mill Goes into Production at National Tube Company's McKeesport Works," Iron and Steel Engineer Vol. 27, No. 6 (June, 1950): 120-22; "Electric Welded Tube Mill Now in Production at McKeesport," Blast Furnace and Steel Plant Vol. 38, No. 7 (July, 1950): 779-82.

[127]"Interview of Vito Lutkus," by author and Gerald Kuncio, July 14, 1989. This interview was conducted at the Main Pipe Mill. Mr. Lutkus was an electrician at the main pipe mill from 1948 to 1986; "Interview of Charles Stine," by author, February 22, 1990. Stine was superintendent of tube and pipe mills at the National Works in the late 1970s and early 1980s; "Interview of Neil B. Duncan," by author, March 14, 1990. Mr. Duncan was general manager of the specifications department at the National

Further expansion of butt-weld capacity came in the early-1960s. Plans for a new facility had been maturing since 1956, when the company acquired a 6.96 acre parcel west of the National Works from the American Sheet and Tin Plate Company, another division of US Steel. This parcel, the old Wood's Works, contained mostly antiquated facilities for producing tinplate and stainless steel plate. Then, in 1961, the National Tube Division acquired an additional parcel in this same area, consisting of 22.02 acres from the Redevelopment Authority of McKeesport, Allegheny County.[128]

The American Bridge Company and the Shiffler Bridge Company began construction of the new facility on October 5, 1962. The decision was made to produce medium-diameter (8 5/8" to 20") butt-weld pipe and to utilize the electric resistance weld (ERW) technology. The ERW method was chosen because it was a proven, clean (no flux) technology. Furthermore, with recent improvements in high frequency AC welders, it was much faster than seamless or other butt-weld methods. Another factor influencing the decision was a new development in metallurgy. The introduction of new high-strength steels (specifically the X-60 grade), which could readily be used as coil in the ERW technology, allowed ERW pipe to be produced with thinner walls than that made using other welding methods. This meant less weight per length, a definite advantage to customers. Also the ERW pipe could be produced in greater lengths, as long as 80', with more uniform walls and a smoother internal surface.

The ERW mill began production in November, 1964. At this time it was one of the most advanced pipe mills of this kind in the world. According to Blast Furnace and Steel Plant, it produced the longest pipe in the world.[129]

Merger and Decline - 1960-70s

In 1969 the National Plant was merged with the Duquesne Plant of US Steel to become the National-Duquesne Works. The main reason for this move was to consolidate the management of

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Works.

[128]"US Steel Announces Plans to Expand into First Ward," Daily News, September 5, 1962.

[129]"Electric Resistance Weld Pipe Mill Produces 80 ft. Lengths at National Works," Iron and Steel Engineer Vol. 41, No. 9 (September, 1964): 244; "U.S. Steel to Expand Pipe Facility," Blast Furnace and Steel Plant Vol. 50, No. 10 (October, 1962): 996-97.

the two plants, which had already been integrated on a functional level. In 1965, National's outmoded blast furnaces and steel plant had been shut down, and steel obtained from Duquesne. Duquesne was a large capacity iron and steel producer with a Basic Oxygen Process (BOP) steelmaking facility and a modern, large capacity blast furnace. Steel ingots were obtained from the Duquesne "BOP shop" via a hot ingot run on the Pennsylvania Railroad Bridge. In 1970, National's No. 1 blast furnace was once again blown-in and ferromanganese production begun. A Chemico gas scrubber and Eimco thickener were added to clean the gas. No. 1 operated until 1979, when it was mothballed.[130]

In 1972 National celebrated its centennial with a dinner attended by US Steel President, E.B. Speer, general superintendent of the National-Duquesne Works, John P. Ely, and a group of retired employees. In his remarks, Ely commemorated the past. He attributed the success of the plant to its employees: "We've always had people here who took pride in their work, in their plant, in their community." Speer directed his comments to National's future. He announced plans for a facilities improvement program to produce deep oil well casing with a minimum yield strength of 110,000 pounds per square inch, permitting wells to be drilled to a depth of 30,000 feet.[131] Despite Speer's remarks, it is apparent, in retrospect, that by this time National was on the decline.

In the late 1970s there were a host of customer complaints and lawsuits against US Steel relating to the quality of oil country pipe and casing. These problems came at a time when the demand for oil country goods was at its height, so there was a strong campaign--on several fronts--to correct them. In 1979 National engineers initiated a quality control program. In addition, US Steel contracted with the Sumitomo Metal Industries, Ltd. plant engineering firm from Osaka, Japan to examine pipemaking facilities and practices at the National and Lorain Plant and make recommendations for improvement. In their report, Sumitomo set out rearrangement plans for seamless No. 1 & No. 2 mills and for No. 1 quench and temper line. The plans called for the installation of additional non-destructive testing equipment

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[130]"National Works Shuts down its Iron and Steel Making Facilities," Daily News, December 23, 1965; these facilities were briefly put back into production in 1966; "No. 1 Blast Furnace Will be Remodeled for Use in Production of Ferromanganese," Daily News, November 5, 1970.

[131]"National Plant 100 Years Young," U.S. Steel News Vo. 37, No. 5 (September-October, 1972): 2-5.

on the seamless No. 1 & No. 2, including the replacement of the hydrostatic tester at No. 2 with a Yamasui hydrotester, and the installation of Amalog electromagnetic testing machines (AMF Turboscope) on the two seamless and the No. 1 quench and temper line. National made these, along with other recommended modifications.[132]

Yet another aspect of the improvement program was the construction of a new heat treatment facility, No. 2 quench and temper line. In 1979 plans were announced to build the "world class" facility, and by 1981, at a cost of $50 million, it was put on-line. In the following year, the No. 3 quench & temper line for smaller diameter pipe was created by transferring heat treating equipment from the Torrance, California plant to the National Plant.[133]

No. 3 quench and temper was used for only one week, a trial run in March, 1982. It was decided not to put the line into full production because of the collapse in the oil and gas market. Production at the main pipe mill was soon curtailed and 600 workers were laid off. More layoffs followed as the plant was put on a schedule of limited operation. As hopes for a recovery dimmed and the crisis worsened in 1984, demolition was started on the blast furnace plant. The decision to close the entire plant came in February, 1987, following a 184 day strike. On August 28, 1987 the National Works at McKeesport, the oldest of the USX Mon Valley plants, was shut down.[134]

Shortly following the closure, two former employees of USX, Al Hilleglass and Pat Campano, recognizing the potential of the facilities, joined in December, 1987 to form the Camp Hill Corporation. The purpose of the corporation was to reopen the

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[132]"Survey Report on Improvement of Seamless Tube Production at National and Loraine Works, "Sumitomo Metal Industries, Ltd., September, 1981: "Interview of Neil B. Duncan," by author, March 14, 1990.

[133]"U. S. Steel Opens New Pipe-Treatment Line," Pittsburgh Business Journal, September 28, 1981; "No. 2 Quench and Temper Line Start-Up Task Force - Final Report," National-Duquesne Works, May 28, 1981.

[134]"No. 3 Q & T Start-up Report," National-Duquesne Works, May 14, 1982; "USX Plans Shock Towns," Daily News, February 5, 1987; James Rankin, "Last of National Workers Punch Out," Daily News, August 29, 1987.

ERW mill, as well as other facilities at National if the market situation so warranted. An agreement was reached with USX whereby USX would furnish the facilities, raw materials and markets, and Camp Hill the capital, management of the operation, and labor. An agreement also was reached with the United Steel Workers of America whereby the operations remained a union shop. The mill returned to production in February, 1988. By 1990, the Camp Hill Works employed 150 men, many of them former USX employees, and produced about 4000 tons of pipe per week.[135]

On January 15, 1991 the historic significance of the National Works was recognized with the erection of a plaque at the site. About 40 dignitaries and city residents attended the dedication ceremony. The plaque, paid for by the United Steel Workers of America, read: "National Tube Works, Incorporated 1869, the works began production here 1872. By 1901, when it became a subsidiary of U.S. Steel, this was the world's largest pipe producer. Major advances in inspection techniques originated here. Plant operations ceased in 1987." The author prefers the salute of one unidentified speaker: "this mill was made holy by the thousands of men and women who had passed through its gates in 115 years of operation."[136]

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[135] "Interview of Clark Breading," by author, November 26, 1989. Mr. Breading is manager of operations at Camp Hill Corporation. The interview and tour was conducted at the ERW mill. "Pact Seen Opening Portion of National," Daily News, December 5, 1987.

[136] "Dedication Remembers Tube Works Past," Daily News, January 16, 1991.

APPENDIX I: NATIONAL TUBE WORKS SITE INVENTORY

CONTENTS - NATIONAL TUBE WORKS SITE INVENTORY

IRONMAKING - BLAST FURNACE PLANT

The Blast Furnace Plant was shut-down in 1979 and demolished in 1985, with the exception of the Blast Furnace Blowing Engine House and the adjacent Blast Furnace Refractory Storage Building. The Blowing Engine House has not been altered since the 1979 shutdown, while the Blast Furnace Storage building has been partially demolished.

Historic Name:	U.S. Steel Corporation, National Tube Works, Blast Furnace Blowing Engine House
Present Name:	USX Corporation, National-Duquesne Works, Blast Furnace Blowing Engine House
Location:	150' south of Monongahela River, 1825' east of Main Pipe Mill, McKeesport, Allegheny County, PA
Construction:	1907
Documentation:	There are no photographs of the Blast Furnace Blowing Engine House

DESCRIPTION

I. Blast Furnace Blowing Engine House:

The Blowing Engine House contains two Ingersoll-Rand topping turbo-blowers and other equipment for generating cold blast, as well as air compressors and water pumps. The building is in good condition.

The building measures 189' x 105'. It is two stories with a basement and is 66' from the floor to the bottom chord of the truss. It is a steel frame structure with buff-colored, common-bond brick curtain walls on the first floor, while the second floor is covered with corrugated galvanized sheet-metal. It is divided into an east bay and a west bay of approximately equal size; each has a separate monitor roof. It has a concrete foundation and floor.

II. Equipment:

A. Two Ingersoll-Rand topping turboblowers: Each turboblower is rated at 90,000 cfm, with steam and air piping and electronic controls for split wind blowing to the three blast furnaces located on the second floor. These turboblowers utilize inlet steam from the Central Boiler House at 850 psi and 750 F. They exhaust steam at 150 psi and 450 F into the plant-wide system. They are 10,400 hp each and generate air at 30 psi.

Installed: 1954.

B. DeLaval Centrifugal Water Pump: The pump is rated at 40 mgd (million gallons per day), and is powered by a 1020 hp four-stage steam turbine located in the basement. It delivers service water to the standpipe from the River Pumphouse.
Installed: 1930.

C. Ingersoll-Rand Two-stage Vertical Water Pump: The 15 mgd service pump is driven by a 400 hp Terry steam turbine located in the basement. It delivers water to the plant service water system.
Installed: 1955.

D. Ingersoll-Rand Two Stage Vertical Water Pump: The 20 mgd water pump is driven by a 500 hp Terry steam turbine. It delivers water to the plant service water system.
Installed: 1964.

E. Two Worthington Air Compressors: Rated at 2,800 (cubic feet per minute) at 110 psi (pounds per square inch), the pumps are driven by 500 hp, 60 cycle, GE electric motors, located on the first floor. The compressors deliver air to the plant system.

F. Three Wilson-Snyder Cooling Water Pumps: Two of the pumps are driven by 125 hp, 150 lb steam turbines and one by an 125 hp, 60 cycle electric motor located on the first floor. They are used to deliver cooling water to the blast furnace stacks.

G. Wilson-Snyder Booster Water Pump: Driven by a 300 hp, 60 cycle motor, the pump is located on the first floor. It is used to boost the Blast Furnace cooling water to 100 psi for use in the higher elevations of the blast furnace structure.
Installed c. 1950s.

H. Two Pacific Water Pumps: Rated at 2,000 gpm, the pumps are driven by steam turbines located in the first floor. They deliver water at 600 psi to the Blooming Mills for use in the hydraulic system.

I. Southwark Barometric Condensor: The condensor is a high-level counter-current type with an electric-driven vacuum pump located adjacent to the building on the west side. It receives exhaust steam from the steam turbines and, prior to their removal, the three Allis-Chalmers and six Southwark blowing engines.
Installed: 1908.

J. Standpipe: Located adjacent to the building on the west side. It is 20' diameter x 144' high, and constructed of two layers of black steel plate. It is used to hold water at 37 psi. Installed: 1930.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, Boiler House "A"
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Blast Furnace Refractory Storage Building
<u>Location</u>: 350' south of Monongahela River, 1875' east of Main Pipe Mill and adjacent to the Blowing Engine House
<u>Construction</u>: 1901
<u>Documentation</u>: There are no photographs of this structure.

DESCRIPTION

I. <u>Boiler House "A"</u>:

The building measures 200' x 100' and is about 40' in height. It is a one-story, steel frame building with buff-colored, common-bond brick curtain walls. The south wall has been removed. It has concrete floors and foundation. The monitor roof is presently uncovered. The original roof covering probably was corrugated steel sheeting. The riveted truss is a Fink. This building contains refractory brick and related materials, as well as various parts for the water pumps in the Blowing Engine House.

HISTORY

The first two blast furnaces at the site were constructed in 1889-90 by the Monongahela Furnace Company, an independent venture with management ties to National Tube Company. Called "A" & "B", each was 90' high x 20' in hearth diameter. In addition, the company built seven 79' high x 21' diameter Cowper-Kennedy hot blast stoves. The fuel used was Connelsville coke, the ore was mostly hematite from Lake Superior. In 1894 the Monongahela Furnaces Company was taken over by the National Tube Works Company.

In 1907, during the US Steel-financed reconstruction of the works, "A" and "B" were rebuilt and a third and fourth blast furnace were built. Denoted "C" & "D", the new furnaces were 90' high with a 22' hearth diameter. To provide hot blast, eight Massicks & Crooke stoves, each 95' high x 22' diameter were built in 1907

It is not known what facilities were provided for generating cold blast prior to 1907. When the extant Blowing Engine House was built in that year, the original equipment included nine vertical, cross-compound, steam blowing engines, three Allis-Chalmers and six Southwark. At this time the blast furnace plant also included four slag granulating pits and a Uehling pig casting machine. (The four blast furnaces were later renamed 1, 2, 3, & 4 with "D" being 1, "C" being 2, etc.) Most of the product was conveyed in molten state to the metal mixer and then to the Bessemer converters. The annual production in 1908 was 650,000 tons of pig iron. Gas cleaning facilities, including a Dorr thickener, were soon added. In 1916 the annual production was 660,000 tons of pig iron. In 1920, Blast Furnaces 3 and 4 (originally "A" and "B") were once again rebuilt. No. 1 (originally "D") was rebuilt in 1924, and No. 2 (originally "C") in 1928. By 1935 iron production was 964,000 tons, and in 1938 it was 1,015,000 tons.

In 1944 a serrated bell was installed on National's No. 1 blast furnace. The purpose of the bell was to more evenly distribute the ore into the furnace during charging. According to a 1947 article, "Blast Furnace Bell Development," in the American Iron and Steel Engineers Institute Yearbook by Truman H. Kennedy, Assistant General Superintendent of National, this was the first installation of such an apparatus. By 1953, Blast Furnaces Nos. 2 and 3 also had serrated bells. Another improvement undertaken in this decade was the installation of a sintering plant in 1949.

In 1950 a two-step blast furnace plant modernization program was initiated that included the construction of a high pressure boiler house and the installation of two topping turboblowers in the Blowing Room. A split-wind setup, by which the two turboblowers could be used to provide air for any number or combination of blast furnaces, as well as the Bessemer converters, was installed. The Central Boiler House was completed in 1950 and the turboblowers were installed in 1954. To make room for the Ingersol-Rand turboblowers, the three Allis-Chalmers blowing engines were removed. The six Southwark engines were retained to handle peak production loads. Later, in the 1970s they were removed. In 1951 pig iron production was 1,280,300. By 1954 it was 1,983,402 tons, and in 1960 production reached 2,311,492 tons.

In 1970, after the merger in 1969 with Duquesne, ferromanganese production began at No. 1 Blast Furnace. A Chemico gas scrubber and Eimco thickener were added to clean the gas. In 1979 No. 1 was shut down. With the exception of the facilities described above, the blast furnace plant was demolished between 1982 and 1985.

Sources:

American Iron and Steel Institute. American Iron and Steel Institute Directory, 1880-1984.

Austermiller, E. O. and Cureton, W. A. "Design and Operation of National Tube's Sintering Plant." Iron and Steel Engineer 28:10 (October 1951): 111-118.

Austermiller, E. O. and Smith, W. A. "The Installation of and Split Wind Blowing with, Topping Turboblowers for Blast Furnaces." Iron and Steel Engineer 33:9 (September 1956): 173-9.

Kennedy, Truman H. "Bell Furnace Bell Development." American Iron and Steel Institute Year Book (1947), 113-124.

National Tube Company. "General Description of Physical Condition of National Works." November, 1938.

USX Corporation, National-Duquesne Works, National Plant. Surplus Equipment Inventory. (1984).

Krepps, Phillip, Turn Foreman and Assistant Superintendent of Shops and Utilities at the National Tube Works, 1950-1982, interview with author, July 7, 1989.

STEELMAKING PLANT - OPEN HEARTH

National had both Bessemer and Open Hearth facilities, and chiefly utilized the duplex steel making process. Built in 1930, the plant was shut down in 1963, and partially demolished in 1984.

Four buildings and some miscellaneous equipment remain. Extant from the Open Hearth plant are three buildings:

1. Scrap House
2. Stockhouse
3. Open Hearth Building (a steel shed complex composed of the Open Hearth Building, the Mixer House and the Bottom House).
4. Bessemer Blower Room (a brick building that has been partially dismantled).

Historic Name: U.S. Steel Corporation, National Tube Company, National Works, Skull Cracker and Cinder Yard
Present Name: USX Corporation, National-Duquesne Works, National Plant, Scrap House
Location: 25' south of Monongahela River, 40' east of McKeesport-Duquesne Highway Bridge, McKeesport, Allegheny County, PA.
Construction: 1931
Documentation: All photographs of the steelmaking plant located in HAER No. PA-380-C.

DESCRIPTION

I. Scrap House:

National generated a considerable amount of scrap, mainly from pipe ends and rejects. Facilities for shearing and crushing it are located at the Scrap House, a structure in fair condition.

The steel frame structure has a concrete foundation and dirt floor, and measures 380' x 77'. The flat Warren trusses are uncovered, their sole purpose being to support the cranes.

The structure is divided into two sections. The 263' x 77' east section, or Cinder Yard, has corrugated metal siding. It is devoid of equipment with the exception of two 15-ton cranes. The 117' x 77' west section, formerly the Skull Cracker but presently the Scrap House, has unusual north and south walls. They are constructed of steel pipe up to the level of the craneway, and above this they are made of steel frame covered with Cyclone fencing. The roof trusses are also covered with Cyclone fencing, put in place to protect motorists passing over the Highway Bridge overhead from debris emitted by the shear. This section contains a 15-ton overhead crane marked "P & H", as well as the Crusher Shear described below.

The 1010-ton Scrap Crusher & Shear was installed in 1978. It was manufactured by Harris. It is a hydraulically driven, guillotine type shear of heavy steel construction. It includes an oscillating, infeed conveyor and hydraulic power unit with eight 60 gpm, 2400 psi Vickers pumps. Scrap was fed into the jaw from the east on a 25', electrically-driven conveyor line, and once crushed, was collected in bins set in hoppers on the west side. Originally designed for flat sections of freight car and ship scrap, the crusher was modified by National engineers to handle pipe.

Historic Name: U.S. Steel Corporation, National Tube Works, Stockhouse
Present Name: USX Corporation, National-Duquesne Works, Stockhouse
Location: 160' south of Monongahela River, 20' east of McKeesport-Duquesne Highway Bridge, McKeesport, Allegheny County, PA
Construction: 1930
Documentation: There are no photographs of the Stockhouse.

DESCRIPTION

The Stockhouse was used to store raw materials for the Open Hearth furnaces and Bessemer converters. The building is in good condition.

The steel frame building measures 290' x 70' and is approximately 40' high from the dirt floor to the bottom chord of the truss. It rests on concrete piers on the north side and a running concrete foundation on the south side. The walls are corrugated galvanized-steel and fitted with a clerestory on all sides. The monitor roof is supported by a Pratt truss and is covered with corrugated galvanized-steel. A single 15-ton crane is located in the north aisle of the building.

A standard gauge railroad track, originating from the yard to the east, runs through the south aisle of the building, terminating at a point 20' west of the building. A second track, situated in the north aisle, leads to the Open Hearth Building. A small, brick sanitary building is located on the west end of the building.

Historic Name: U.S. Steel Corporation, National Tube Works, Open Hearth Building
Present Name: USX Corporation, National-Duquesne Works, Open Hearth Building
Location: 160' south of Monongahela River, 330' east of the McKeesport-Duquesne Highway Bridge, McKeesport, Allegheny County, PA
Construction: 1930
Documentation: Photographs of the Open Hearth Building and Bottom House are located in HAER No. PA-380-C.

DESCRIPTION

I. Open Hearth Building:

The Open Hearth Building contains the #3 Billet Peeler, placed there in 1980 and used to condition rounds for the seamless pipemaking production lines. The building, with the original siding, is in fair condition.

The Open Hearth Building is a steel frame, metal-clad complex that measures 720' x 300'. It rests on a concrete foundation. It is divided into three sections:

A. Open Hearth Furnace Building: The building measures 720' x 156'. The walls are made of black steel-plate and appear to be original. There are no windows, but the building is fitted with louvers for ventilation. It is 79'-6" high from the dirt floor to the bottom chord of the roof. The monitor roof is supported by a Pratt truss and covered with sheet-metal. The steel frame supports a craneway upon which is a EOT 7 1/2-ton Wright Crane.
Installed: 1962

The building is divided into a charging bay 60' wide and a pouring bay 96' wide. Also, a Ladle Repair Shop is located on the west end. The charging floor has been removed and the interior space converted into a pipe storage area. A standard gauge railroad line, upon which a diesel locomotive marked "National Works" rests, runs the length of the building. Just outside the building on the north side is the hot metal trestle, which formerly supported a railway leading from the Blast Furnace Plant to the Mixer Building. Also on the north side are the remains of storage bins, and the Tar Storage and Pumping station, which consists of two black steel, oil and tar tanks, each with a capacity of 210,000 gallons, and a pumping station equipped with a Munroe boiler for steam atomization.

B. Mixer House: Attached to the north side of the Open Hearth Furnace is the Mixer House. It measures 230' x 75' and is 79'-6" from the concrete floor to the bottom chord of the truss. The roof covering and walls are composed of galvanized sheet metal which appears to have been installed recently. There are no windows or louvers. The roof has two gables and monitors and is supported by a Pratt truss.

The Mixer House contains the Peeler Control Building, a 60' x 30' concrete block building, constructed in 1980, in which the electric substation for the #3 Billet Peeler is located.

C. Bottom House: Attached to the north side of the Mixer House is the Bottom House. It measures 230' x 69' and is 52'-6" from the concrete floor to the bottom chord of the truss. The north side of the building has a brick wall which rises to about 12'; above this level the walls, as well as the roof covering, are galvanized sheet-metal similar to those of the Mixer House. The gable roof is supported by a Pratt truss and has a north-facing sawtooth monitor.

The Bottom House contains the #3 Billet Peeler, a round conditioning machine driven by a 300 hp electric motor with oil-hydraulic power for auxiliary functions. The charging and discharging conveyors, as well as the ingoing and outgoing transfer tables, are electrically driven. Manufactured in 1955 by engineers at the National Plant and installed in the Bottom House in 1980, it handled rounds from 4" to 13" in diameter and had a capacity of 15,000 to 20,000 tons per month.

STEELMAKING PLANT - BESSEMER

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, Bessemer Blower House
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Bessemer Blower House
<u>Location</u>: 340' south of Monongahela River, 1200 west of the McKeesport-Duquesne Highway Bridge, McKeesport, Allegheny County, PA
<u>Construction</u>: 1930
<u>Documentation</u>: There are no photographs of the Bessemer Blower House.

DESCRIPTION

I. <u>Bessemer Blower House</u>:

The Bessemer Blower House, last used in 1963, is one of the few remaining structures of its kind in the country. The blowing engines have been removed, however, and the east wall has been partially dismantled.

The Bessemer Blower House measures 90' x 70' and is 58'-6" from the concrete floor to the bottom chord of the truss. It is two stories, the second being the operating floor. It is linked to the Open Hearth Building by a one-story brick sanitary building. The common-bond, red brick walls have an interior steel frame and are fitted with rectangular windows on the first and second floor and clerestory. The gable roof is supported by a Pratt truss and is covered with metal sheeting. Three ventilators are mounted along the ridge line.

The three steam-driven turbo-blowers have been removed from the second floor, undoubtedly through the large hole in the east wall. However, the manifold and piping on the first floor remain, along with a 26" cold blast air main that runs along the exterior of the building on the west and north sides. This air main connected the blast furnace turbo-blowers to the Bessemer manifold, allowing them to supply air to the converters.

The No. 5 MG Substation, a common-bond, red brick building constructed in 1930, is located 20' north of the Bessemer Blower House. It measures 60' x 30' and has a gable roof covered with metal sheeting capped with tar.

HISTORY

The National Tube Works began the production of wrought iron pipe in 1872. It made the changeover to steel during the twenty year period from 1886 to 1906, though the company continued to make wrought iron pipe through the 1930s. The company's first venture in steel-making was in 1886, when it installed a 18-ton Siemens, acid open hearth furnace of which there are no remains.

In 1893 the company acquired the adjacent Monongahela Furnace Company and installed a Bessemer plant consisting of two 8-ton converters, three 10' cupolas and three 5-hole soaking pits. Wind for the converters was supplied by two Mackintosh, Hemphill & Co. horizontal, compound, tandem steam blowing engines operating at 140 pounds of steam, provided by five batteries of Babcock & Wilcox boilers at "C" Boiler House. This facility was located approximately 160' east of Blast Furnace No. 4 on the northern side of the plant. No above-ground remains of this facility exist.

Finding Bessemer-steel preferable to open-hearth, the company abandoned the open hearth furnace in 1896. By 1906, with the completion of the steel Skelp Mills, the transition from iron to steel was complete, though the company continued to make small quantities of wrought iron pipe for some time afterward.

The original Scrap House and Scull Cracker building was erected in 1906. Located on the west side of the McKeesport-Duquesne Highway Bridge, it contained a South Boston Iron Co. 6600# steam hammer and a Marchland & Morgan steam hammer. This facility was removed in 1930, at which time a new steel plant was built. (The earlier Bessemer plant was demolished in the same year to make way for the Bar Mill and additions to the Blooming Mill.)

The new plant consisted of three 25-ton Bessemer converters, two 800-ton hot metal mixers and three 250-ton Open Hearth furnaces. The converters were placed outdoors in a Bessemer Bay between the Bottom House and the Bessemer Blowing Room. Wind for the Bessemers was provided by three General Electric centrifugal blowers direct driven by steam turbines. Built by the Pennsylvania Engineering Works of New Castle, this plant was designed for use either as a straight open hearth plant or for duplex operation in which the partly blown metal from the converters was finished in the open hearth furnaces. In practice, it was used almost exclusively in the duplex process. The fuels used in the open hearth furnaces were tar, oil and a mix of coke oven and natural gas. Each of the open-hearth furnaces was equipped with Connolly waste-heat boilers which generated enough high-pressure steam to run the turbo-blowers for the Bessemers. Two Porter fireless locomotives were employed, one to handle charging-box cars on the open-hearth floor, and the other to haul Bessemer ladles. (The locomotives took steam from valves at the Blast Furnace Blowing Room two or three times a day and stored it in tanks.)

The new plant, contained in the buildings described above, also included the Stockhouse and the Scrap House and Skull Cracker. In addition, a 340' x 75' Mould Yard and Ingot Stripper Building was built approximately 20' north of the main complex. There are no above-ground remains of this building.

The steel plant was shut-down in 1963, after which time all steel came from the Duquesne Plant. The steel making equipment was removed in the 1970s. After this time, there was limited adaptive reuse of the facilities. Parts of the buildings were used as general purpose storage areas, the Open Hearth Furnace building being used for pipe storage. The Scrap House was used to process rejected pipe for use at the furnaces of the Edgar Thompson or Duquesne plants. In addition, the Mixer House and Bottom House contained the #3 Billet Peeler and Substation.

<u>Sources</u>:

"As Seen by an Engineer." <u>Engineering News</u> 34 (October 10, 1895): 243-44.

"New Steel-Making Equipment at National Tube Co. Works." <u>Iron Age</u> (May 21, 1931): 1667-1672.

"An 1893 Bessemer Steel Works." <u>Iron Age</u> 52 (November 16, 1893): 891-894.

National Rolling Mills. "Scrap House and Scull Cracker, General Plan and Cross Section." Drawing #2669. September 14, 1905.

National Tube Company. "Blast Furnaces and Steel Works, General Plan of Steam Piping and Exhaust Lines." Drawing #3399. February 8, 1911.

"Manufacture of Steel Pipe." <u>Scientific American</u> 89 (December 12, 1903): 434-35.

William Speidel, Assistant Superintendent of the Rolling Division at the National Plant, interview with author, October 27, 1989.

STEELSHAPING - ROLLING MILLS

National had two 40" Blooming Mills and a 32" Bar Mill for rolling steel, located in a steel-shed complex. With the exception of eight Mesta 32" Bar Mill stands, the rolling machinery has been removed. The structure was partially dismantled, and nearby buildings connected with rolling have been demolished.

In addition to the Blooming and Bar Mill building, the buildings which housed the Skelp Mills between 1906 and 1936 also remain. Since these have been converted to other uses, they are described elsewhere. Historical information on the rolling equipment, which was removed largely in the late 1930s, is included in the history section of this report.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, #1 & #2 Blooming Mills, 32" Bar Mill
<u>Present Name</u>: USX Corporation, National-Duquesne Works, #1 & #2 Blooming Mills, 32" Bar Mill
<u>Location</u>: 100' south of Monongahela River, 2120' west of the McKeesport-Duquesne Highway Bridge
<u>Construction</u>: 1893, 1906, 1930 for Blooming Mills, 1930 for Bar Mill
<u>Documentation</u>: There are no photographs of the Blooming or Bar Mills

DESCRIPTION

The steel-shed complex measures 640' x 270'. It is a steel frame structure with corrugated metal siding and roof covering. The foundation is concrete and the floors are mostly concrete with some areas of dirt. It is divided into two sections:

I. <u>Blooming Mill Building</u>: The building measures 230' x 220', and it is 36' from the floor to the bottom chord of the roof truss. The monitor roof has a Pratt truss. There are four intact EOT cranes: a 1930 20-ton Morgan; a 25-ton Harnschfegar installed in 1962; and two 25-ton Morgan units installed in 1908 and 1931.

On the south end of the structure is the Bloom Yard, an exterior storage space with craneway measuring 150' x 65'. There are two EOT cranes on the craneway, a 10-ton unit manufactured by Harnschfeger, installed in 1931, and a 15-ton model manufactured by the National Tube Company, installed in 1944.

With the exception of the cranes, there is no intact machinery inside the building; both Blooming Mills have been dismantled and removed. The Low Pressure Power Station, which generated AC current with exhaust steam from the Blooming Mill steam engines, is located just south of the Blooming Mill. (See report on Electric Power Generation.)

II. Bar Mill Building: The building is attached to the northwest side of the complex. It measures 790' x 150' and is about 50' from the floor to the bottom of the roof truss. The walls above the craneway are fitted with movable louvers.

The building is divided into two bays, a 32" Bar Mill bay and a Conditioning bay. Both have saw-tooth monitor roofs. The Bar Mill bay has modified Fink trusses, while the Conditioning bay has Pratt trusses. The Main bay is flanked on the north by the Roll Storage area, an attached lean-to structure in which eight 32" Mesta Bar Mill stands and rolls are located. There is a 15-ton EOT crane located in the Conditioning bay. The Bar Mill bay of the building has been partially dismantled.

HISTORY

In 1879 the National Rolling Mills, located about a quarter mill down river from National Tube Company, started its iron making and rolling operations. The company, separate from the National Tube Works yet owned by nearly the same financial interests, was founded to produce skelp for the tube mills. Rolling Mill No. 1, built in 1879, consisted of fourteen Siemens double puddling furnaces, ten heating furnaces, two sets of 3-high muck rolls, one plate mill, and one continuous mill. In 1881 the National Forge and Iron Works, a subsidiary of the National Rolling Mills, built its works on the McKeesport site. It included sixteen forge fires, one run-out fire, two hammers, one heating furnace, and one set of slab rolls. In 1882 the National Rolling Mills added Rolling Mill No. 2. It contained eighteen single puddling furnaces, one heating furnace, one set of slab rolls and two 8-ton hammers. In 1886 the Rolling Mills company added the Siemens open-hearth steel furnace to Rolling Mill No. 1. Also in 1886 Rolling Mill No. 3 was built; it was equipped with forty-two single puddling furnaces and two sets of 3-high muck rolls. Rolling Mill No. 4 was built in 1887. It contained 6 heating furnaces, one 13" and one 24" train of rolls. In 1890 the above mills produced 112,000 net tons of semi-finished iron. In 1891 the National Rolling Mills company was consolidated with the National Tube Company.

In 1893, when the Bessemer Steel Plant was installed, a mill for rolling steel was built, consisting of a 35" Blooming and Slabbing Mill, driven by a pair of 36" x 48" Mackintosh, Hemphill

& Co. steam engines. (The Main Bay of the Blooming Mill Building dates to this construction.) The facilities for rolling iron, including the four rolling mills and forge, were phased-out when the company made the transition to steel in the 1890s and early 1900s.

The 35" Blooming and Slabbing Mill was discarded in 1904 when a Mesta 40" Universal Slabbing mill of the two-high reversing type was installed. The new mill was termed "unique" in a September 29, 1904 Iron Age article because it had two, rather than three or four vertical rolls. The horizontal rolls were driven by a pair of 46" x 60" piston-valve reversing steam engines; the vertical rolls by a pair of 36" x 48" piston-valve reversing engines.

The Blooming Mill Building was raised and extended during the 1906 plant expansion. The Mesta 40" Universal Slabbing Mill was retained in the new facility. A second 40" Blooming Mill was added and placed on a parallel line. Both were steam-driven reversing mills, and included Mackintosh, Hemphill & Co. shears. In the same year the 520' x 100' Soaking Pit Building, now demolished, with ten batteries and twenty-six pits, was added south of the Blooming Mill Building.

Another part of the 1906 expansion was the construction of the Skelp Mills, consisting of the 110" Plate Mill, the 42" Universal Mill, the 16" Mill, and the 13" Mill. Each of the four mills had its own heating furnaces in a separate building. The facilities were built to roll steel skelp for the lap- and butt-weld tube mills.

The 110" Plate Mill was housed in what is now the Pipe Storage Building. Its heating furnace building has been demolished. It was equipped with a three-high, 34" x 110", reversing Plate Mill manufactured by Mackintosh, Hemphill & Co. The mill was driven by a 38" & 70" x 60" horizontal, tandem, compound, condensing Brown-Corliss steam engine with a fly-ball governor. The engine ran at an average steam pressure of 165 lbs. and was directly connected to the 110" Plate Mill. It exhausted into a barometric, counter-current condensor with a Weiss air pump which was located between the Plate Mill Building and the 42" Mill Building. (This condensor also served the two engines in the 16" Mill Building.) In addition to the Plate Mill, original equipment consisted of a electrically-driven, guillotine-type hydraulic shear, manufactured by the R. D. Wood Company, for cutting plate lengthwise; an electrically-driven, knife-type Rotary Trim Shear manufactured by R. S. Newbold & Sons for trimming edges; a nine roll, electrically-driven R. S. Newbold Straightening machine; electrically-driven transfer tables; and a 20-ton Repair and 10-ton Stocking (plate handling) Crane, both electrically-powered and manufactured by the National Tube Company.

The 42" Mill, housed in what is now the Spare Parts Storage building, was a three-high, universal, reversing mill manufactured by A. Garrison Foundry Co. with electric motor-driven screwdowns. A guillotine-type, hydraulic shear built by the National Tube Company, and a nine roll, electric motor-driven straightener made by Hilles & Jones Company were also included as original equipment. All of the conveyor tables were electric motor driven. The heating furnaces were contained in the 42" Heating Furnace building, still standing and now connected to the Spare Parts Storage Building. The main power source for the 42" Mill was a 35" & 62" x 54" horizontal, tandem, compound, condensing-type steam engine manufactured by the Southwark Foundry and Machine Company, that operated at 150 lbs. of steam. Exhaust steam was condensed in a barometric, counter-current condenser built by Southwark with a Weiss air pump. The 42" Mill produced skelp in widths ranging from 11-3/4" to 33-1/4". When the mill was first installed, it was equipped with two sets of vertical rolls, one set on the ingoing and one set on the outgoing side. The set on the outgoing side was dispensed with prior to 1911.

The 16" Mill, housed in what is now the No. 2 Pipe Finishing building, was a two-high continuous mill designed by the National Tube Company and built by Mesta Machine Company. The mill was arranged in three groups of three passes each, with one bull-head pass. The roughing stands were powered by a 38" & 70" x 60" horizontal, tandem, compound, condensing steam engine manufactured by Brown-Corliss. The engine operated on 150 lbs. of steam. The finishing stands were powered by a 24" & 44" x 48" horizontal, tandem, compound, condensing engine manufactured by Brown-Corliss. It operated on 150 lbs of steam. Both engines exhausted into a Southwark barometric, counter-current condensor that was shared with the 110" Plate Mill. The 16" Mill included electrically-driven transfer tables, a flying shear and two cupping and clipping shears. There were also four heating furnaces located in the 16" heating furnace building, which is now the Brick Storage Building.

The 13" Skelp Mill, housed in the No. 2 Quench and Temper building, consisted of a two-high mill with eight stands, both roughing and finishing, built by the National Tube Company, transfer tables, an edging shear, a hydraulic shear manufactured by Garrison, and heating furnaces housed in what is now the Storage Building. The roughing stands were driven by a 24" & 44" x 48" Brown-Corliss, horizontal, tandem, compound, condensing steam engine with fly-ball governor operating at 150 lbs. of steam. The finishing stands were driven by a 30" & 54" x 60" Allis-Chalmers, horizontal, tandem, compound, condensing steam engine with fly-ball governor operating at 150 lbs. steam. Both engines exhausted into a barometric, counter-current steam condensor manufactured by Southwark. This condensor also handled steam from the 42" Mill. The 13" Mill produced skelp in sizes ranging from 2-1/8" to 7-3/4" for use in the plant's pipemaking operations.

In 1910 the Low Pressure Power Station was installed adjacent to the Blooming Mill building to utilize exhaust steam from the Blooming and Slabbing Mills in order to generate electricity for plant use. (See Electric Generating System.)

In 1930 the Bar Mill building was constructed and the 32" Bar Mill installed to produce rounds for the new seamless mills. The Bar Mill was the reversing type, manufactured by Mesta, and driven by a 3000 hp Westinghouse electric motor. A hot saw line with two rotary-type saws was also installed, along with pickling vats, three billet peelers and facilities for scarfing and inspection. Also, in 1930 the 40" Slabbing Mill was converted from a universal slabber to a straight, two-high Blooming Mill; and, to tie the conveyor lines of the Blooming Mills with the Bar Mill, a turntable was installed.

The Blooming and Bar Mill buildings were renovated in the 1956-1960 period. Also at this time, Billet Peelers No. 1 and No. 2 were installed in the Conditioning Bay of the Bar Mill.

The Blooming and Bar Mills reached peak production in the late 1960s. In 1967 the Blooming Mills produced 1,603,700 tons, and the Bar Mill produced 799,800 tons of semi-finished steel. In 1963 when the steel making facilities were shut-down at National, ingots were obtained from the Duquesne BOP Shop via a hot ingot run on the Pennsylvania Railroad Bridge. In 1980 the hot ingot run was eliminated and the Blooming and Bar Mills were shut-down. After this, rounds for the seamless mills were obtained from the Duquesne Bar Mill and conditioned on Billet Peeler #3 at the Bottom House. The Blooming and Bar Mill was partially dismantled in 1984-5.

<u>Sources</u>:

<u>American Iron and Steel Institute Directory</u>. 1890, 1892, 1894.

"An 1893 Bessemer Steel Works." <u>Iron Age</u> 52 (November 16, 1893): 891-94.

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National Tube Company, National Works. "General Description of Physical Condition of National Works." November, 1937.

Spiedel, William, Assistant Superintendent of Rolling at the National Plant, interview with author, October 27, 1989.

United States Steel Corporation. "Facilities to Improve Quality of Seamless Tubular Product." May 7, 1980.

United States Steel Corporation. "Surplus Equipment Inventory Mon Valley Works - National - Duquesne Plants." Book 2 of 4, Nd. Np.

United States Steel Corporation. National Tube Division. "General Plan." Drawing #B-2. December 30, 1953.

STEELSHAPING - PIPEMAKING

Since beginning in 1872, the sole product line of the National Plant has been tubular goods, largely pipe for drilling and transmission of oil and gas. The plant became the nation's largest producer of tubular goods in the early-1890s and held that position until it closed in 1984.

There are two main facilities for pipemaking at the National Plant: the Electric Resistance Weld (ERW) Mill, built in 1964, and the Main Pipe Mill, built in 1906. The Main Pipe mill contains three pipemaking production lines, the Seamless No. 1 and 2 Mills and the Submerged Arc Weld (SAW) Mill, as well as the Upset Department for finishing drill pipe and a heat treating line, No. 1 Quench and Temper. With some important exceptions, these lines are presently intact. The equipment, largely dating to the period between 1930 - 1970, is in fair to good condition. It has a considerable measure of both market and historic value. It is the largest assemblage of pipemaking machinery in the nation, if not in the world.

Of even more historic value than the equipment is the Main Pipe Mill building itself. Designed and erected by the American Bridge Company in 1906, it is notable for its structural design and its large size and scale. Encompassing over twenty-three acres and having one span of 158', the building was acclaimed as the largest mill building in the world until the late 1920s. Both in 1906 and 1911, Iron Age hailed it as the "largest building under one continuous roof in the world."

Despite the addition of the Billet Storage Bay on the north side in 1930 and several small additions and modifications of the roof covering and walls, the building retains most of its 1906 structural features. Certainly, the steel framing and trusses have not been altered. The brick curtain walls are largely original, though they have been modified somewhat by defenestration. Presently, the building is in fair to good condition. The major problems are with the roof, which leaks in some areas, and the walls, which are unsound in places.

Historic Name: U.S. Steel Corporation, National Tube Works, Main Pipe Mill Building
Present Name: USX Corporation, National-Duquesne Works, Main Pipe Mill Building
Location: 175' south of Monongahela River, 600' from the Electric Resistance Weld Mill, McKeesport, Allegheny County, PA
Construction: 1906

Documentation: Photographs of the Main Pipe Mill can be found in HAER No. PA-380-A.

DESCRIPTION

The building, including annexes, measures 1613' x 720'. It is divided into twenty production bays running north and south, and six transfer and storage bays running east and west. The transfer and storage bays include the Billet Storage Bay (not numbered) along the north side and an outdoor shipping bay (Bay 5) at the south side. The structural system is comprised of steel framing, with brick-encased steel columns along the perimeter walls and interior steel columns supporting the trusses and craneways. The foundation is mostly brick with some areas of concrete. The floors are mostly concrete with some areas of dirt where the twelve McKeesport Connecting Railroad lines enter the building. There are numerous below-grade cellars and storage basins. The curtain walls are buff-colored, common-bond brick, with the exception of the Billet Storage Bay and Bay 1, which are covered with corrugated metal. There are windows, most of which have been in-flled with translucent fiberglass or concrete block, on the first story, the clerestory, and in the monitors. The roof trusses, made of riveted-steel, vary as described below. The roof is covered mostly with corrugated metal sheeting coated with tar in certain places. However, there are areas of wood sheathing covered with asbestos roll roofing, and the unnumbered Billet Storage Bay is covered with sheeting made of a fiberglass-asbestos composite material.

The roof systems in the Main Pipe Mill building are laid-out on an east-west axis. The production lines, on the other hand, are laid-out on a north-south axis.

The following descriptions of roof systems are designated by column lines. The letter designations begin on the south or front side of the building and run from column lines A to R, with B supporting the main south wall and R the main north wall.

The section from column line A to B is 55'-7" wide. It is mainly uncovered. It includes the craneway and cranes of the outdoor shipping bay (Bay 5), and three brick annexes: the Shippers and Riggers Building, the Die Shop and Mill Office, and a Water Cooling Tower.

The section from column line B, the south brick wall, to C is 79'-3" wide. It is approximately 40' from the floor to the bottom chord of the truss. The monitor roof is supported by Pratt trusswork.

The seven sections from Column line C to P are 269' wide altogether. They are a series of identical sawtooth roof systems supported by rows of interior steel columns. Ventilation is provided mainly by louvers, but there are individual vents mounted above the ridge in areas located above the furnaces. This section is 25' from the floor to the bottom chord of the truss.

The section from Column line P to Q, also designated Bay 3, is a 60'-9" span with a monitor roof. The truss is a Compound Fan design. It is 47' from the floor to the bottom chord of the truss.

The section from column line Q to R, which includes Bays 1 & 2, is 158' wide. It is a single span, gambrel roof with a steel truss formed in the Howe design. The truss members and the diagonal bracing, as well as the horizontal girders upon which they rest, are massive. There are twenty-one rectangular ventilation hoods atop the roof. It is 35' from the floor to the bottom chord of the truss. It is notable that this roof system, rather than additional interior columns, provides the sole support for the central craneway for the electric traveling cranes in Bays 1 & 2.

The Billet Storage Bay, which runs 720' on the north side of the building, is 85'-8" wide with Fink trusswork. It is 35' from the floor to the bottom chord of the trusses. There are rectangular ventilation hoods atop the roof. Also on the north side is the Motor Room annex, a two-story brick structure; the Pipe Shop annex, a metal-clad, one-story structure where paint is housed; and the X-Ray Equipment annex, a recently-built, metal clad structure for housing x-ray equipment.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, Main Pipe Mill, Upset Department
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Main Pipe Mill, Upset Department
<u>Location</u>: Bays 24 & 25 of the Main Pipe Mill
<u>Construction</u>: 1930
<u>Documentation</u>: Photographs of the Main Pipe Mill can be found in HAER No. PA-380-A

DESCRIPTION

The Upset Department contains equipment for finishing drill pipe in sizes from 4-1/2" to 6-5/8". Two types of finishing processes were used in this department, including upsetting and normalizing.

Upsetting involved reshaping the end of drill pipe so as to provide a thicker cross-section for threading. This strengthened the drill pipe at what otherwise would have been the weakest point, the coupling, thereby increasing the overall torsional strength of the drill stem. The average production of the upset line was 80 tons per turn. This line was integrated with both the #1 Seamless Finishing Line and the #1 Quench and Temper Line. And, for a short time in 1982--a one week trial period--with the #3 Quench and Temper Line, located in the 16" Mill Building. The flow pattern was somewhat complicated and required several movements of the product by crane or truck. The unfinished pipe was received from Bay 17, processed in Bay 24 on the Upset Furnace and Press, sent for Quench and Temper processing to #1 or, for a short time #3, and then returned to Bays 24 and 25 for threading, straightening, facing, inspection and shipping.

Normalizing was the process used for non-quench and temper grades of drill pipe. This process was last used around the 1960s. In this process, unfinished pipe from the Cut-off machines in Bay 17 in the #1 Seamless Line was transferred to Bay 24 for normalizing, then finished and shipped in Bay 25.

This equipment was installed largely in 1930. The Blast Cleaning Machine dates to about the 1960s. All of the major machinery is intact, but parts of the conveyor line have been dismantled.

I. <u>Upset Furnace and Press</u>: This equipment is located in Bay 24. The furnace is a continuous, recuperating type of unknown make that burns natural gas. Charging and discharging are accomplished by a motor-driven sprocket-chain moving across a transfer table. The end of the pipe is heated to forging temperature (2300 to 2400 degrees F.). The press was manufactured by Ajax Manufacturing Company. It is powered by a 200 hp induction motor and hydraulics. It consists of a press, dies and mandrels that reshape the heated end of the pipe so as to provide additional width (and strength) in the area where the thread is cut.

II. <u>Normalizing Furnace</u>: Located in Bay 24, this furnace is of unknown make. It is a continuous, non-recuperating type fired by natural gas. It includes loading and cooling tables. Rolling of the pipe across the hearth is performed manually with picker bars. The pipe is conveyed to and from the furnace by motor driven rolls. This furnace was utilized in the finishing of non-quench and temper grades of drill pipe.

III. <u>Gag Straightener</u>: Located in Bay 24, this unit was manufactured by the American Sheet and Tin Plate Company. It is a size 16" model. It is driven by an electric motor.

IV. Four End Facers: Located in Bay 24, these units were manufactured by Taylor-Wilson. They square the ends of the pipe prior to threading.

V. Grinding and Inspection Tables: Located in Bay 24, these two tables were for grinding away surface blemishes on the pipe and for the inspection of the pipe. No equipment is present.

VI. Two Lathes or Threading Machines: Located in Bay 25, they are model TC8 and manufactured by Gisholt-Criden. They used both electric motors and hydraulic power to thread the pipe.

VII. Gag Straightener: Located in Bay 25, this unit appears identical to the one in Bay 24.

VIII. Blast Cleaning Machine: Located in Bay 25, this machine was manufactured by Pangborn Cleaning and Dust Control Equipment Company. It consists of an motor-driven fan, a feeder for loading a chute with steel shot or sand, orifices for delivering and collecting the cleaning agent, and a steel frame for securing pipe. The machine cleans pipe by blasting the inside with sand or steel shot.

Historic Name:	U.S. Steel Corporation, National Tube Works, Main Pipe Mill, Seamless No. 2 Mill
Present Name:	USX Corporation, National-Duquesne Works, Main Pipe Mill, Seamless No. 2 Mill
Location:	Main Pipe Mill: portions of the Billet Storage Bay and Bays 1, 2, 3, 4 and 19 and the major parts of Bays 20, 21, 22, and 23.
Construction:	1930, 1966 for Rotary Hearth Furnace
Documentation:	Photographs of the Main Pipe Mill can be found in HAER No. PA-380-A

DESCRIPTION

This mill includes equipment for producing rolled tubes with an O. D. of 6-5/8" to 14-3/8" with the dual, Mannesmann type piercers alone or in sizes of 16" to 24" O. D. with the Rotary Roller. The product is moved from machine to machine on a continuous roller line driven by small electric motors. The flow of the product is in the sequence presented below. Shipping facilities are located in part of Bay 23. Each bay is served by one or more electric overhead traveling cranes. The main products are pipe casing and line pipe.

The Sutton Straightener has been removed from the hot end of the line, while Cooling Tables #2 and #3 and the Sinking Sizing Mill have been dismantled. The Yamasui Tester and the End Facer have been removed from the finishing end.

I. <u>#2 Seamless Hot Mill in Sequence</u>:

A. <u>Rotary Hearth Furnace</u>: Located in bays 1 and 2, the 90' diameter furnace was manufactured by Salem-Brosius Company. It was installed in 1966, replacing # 1, #2, and #3 Billet furnaces. It consists of a motor driven charging machine, a roof fired rotary furnace with a motor driven turntable, and a motor driven discharging machine. The furnace is divided into four control zones and burns either coke oven gas or natural gas. It is the recirculating type. It is capable of heating 100 tons of billets to a temperature of 2160 degrees F.

B. <u>#1 & #2 Piercers</u>: Located in Bay 1 north of Bay 15, the Mannesmann-type piercers were made by the Aetna Standard Engineering Company. They consist of two rolls, set side by side, inclined at opposite angles to the horizontal center line of the mill. The rolls revolve in the same direction at 95 rpm through a drive unit powered by a Westinghouse 3500 hp, 6600 volt, 25 cycle, synchronous motor. The roll setting or gorge is adjusted by a motor driven screw. The angle of inclination, known as the bearing angle, is adjustable from 4 1/2 degrees to 11 degrees by a manual screw system. The rolls create a fracture in the billet center into which a mandrel point is placed to enlarge and shape the cavity. Concave guide shoes located at the top and bottom of the pass at the exit end control the O. D. of the shell. The second piercer elongates the shell. Additional equipment for each piercer includes an internally water cooled mandrel bar upon which the mandrel or point is set. The mandrel bar is mounted on a thrust carriage that positions it on the exit end of the rolls. Ancillary equipment for each piercer consists of an air operated hot billet kickout for raising billets from the hot billet conveyor to the inlet table, an air operated billet ram for pushing billets into the rolls, and an outlet roll for moving the pierced billet or shell to the stripper block for removal of the mandrel.

C. <u>First Reheat Furnace</u>: Located in Bay 1 north of Bay 19, it was manufactured by the Rust Engineering Corporation. It is a single zone continuous heating furnace that is operated on a 500 BTU coke oven and natural gas mixture. Charging and discharging of shells into the furnace is by air operated rams. Rolling of the shells across the hearth is started by a mechanical pusher and continued manually with picker bars. The shells are conveyed to and from the furnace by motor driven rolls. The furnace reheats shells to working temperature. It is used only if there are delays on the line.

D. High Mill: Located in Bays 1, 2 and 3 north of Bay 20, it was manufactured by the Aetna Standard Engineering Company. The mill is the return type in which the shell is returned to the entering side of the rolls for additional passes. It consists of a single two-high stand of working rolls and a pair of stripper rolls. The working rolls are driven through a direct drive unit by a Westinghouse 2000 hp, 6600 volts, 25 cycle synchronous motor. The roll setting is adjusted by a motor driven screw. Rolls have 2 to 4 open pass grooves, though only one groove is used at a time. The shell is further elongated by this mill. Ancillary equipment consists of an internally water cooled mandrel bar upon which a plug is fitted, an air actuated charging ram, and motor driven inlet and outlet tables. This mill was made in 1964.

E. Second Reheat Furnace: Located in Bay 1 north of Bay 20, it is identical to the First Reheat Furnace (see C).

F. Rotary Rolling Mill: Located in Bays 19 and 2, this mill was made by the Aetna Standard Engineering Company. It consists of two conical rolls or discs with axes at a 60 degree horizontal angle with the center line of the mill. Each disc is driven by a separate motor, all of which have been removed. Horizontal setting of each disc is controlled by a separate motor driven screw. Concave guide shoes located at the top and bottom of the pass shape and control the shell's outside diameter. The mill enlarges the shell to a diameter between 16" and 24". Ancillary equipment consists of an internally water cooled mandrel bar, mandrel thrust carriage and plugs, and motor driven trough conveyor.

G. Sinking Sizing Mill: Located in Bay 20 in line with the conveyor to the reelers, it consists of one stand of single groove two-high rolls. The manufacturer is unknown, and it has been partially dismantled.

H. East and West Reelers: Located in Bay 20 and Bay 4, they were made by the Aetna Standard Engineering Company. Construction of the reelers is similar to the Mannesmann-type piercers. They consist of two slightly tapered cylindrical rolls inclined at opposite angles with the horizontal. The rolls are driven by Allis Chalmers 600 hp, 6600 volts, 25 cycle, induction-type motors. The reelers burnish the inside and outside diameter of the shell. The reelers alternate shells to maintain the production rate. Ancillary equipment includes internally water cooled mandrel bars and motor driven inlet and outlet roller conveyors.

I. Third Reheat Furnace: Located in Bay 20 and extending into Bay 4, it is a single zone continuous heating, barrel-type, recuperating furnace. It is operated on a 500 BTU mixture of coke oven and natural gas. Charging and discharging of shells is through motor driven roller conveyors.

J. First and Second Sizer: Located in Bay 21, the identical mills consist of one stand of single groove two high rolls driven through reduction gearing by a Westinghouse, 150 hp, 230 volt DC motor. Roll setting is adjusted by a screw arrangement turned by a hand wheel. The sizers reduce the shell to a consistent, outside diameter.

K. First, Second & Third Cooling Tables: Located in Bay 21, these roll-over tables are equipped with sprocket chains with projections to move shells over table for air and water cooling. The chains are driven by variable speed motor. Table #2 is dismantled, while #3 is partially dismantled. The straightener, formerly located in Bay 21 after the cooling tables, has been removed.

II. #2 Seamless Finishing in Sequence:

A. Amalog Testing Machine: Located in Bay 1 north of Bay 21, this unit includes a Fairfield pinch roller and an AMF Tuboscope for non-destructive testing. This is a 1970s addition to the line. An inspection table and pipe rotator are also located there.

B. Ten Cutting-off Machines: Located in Bay 22 and in Bays 1, 2 and 3 north of Bay 22, these motor driven machines are of unknown make. Six are 16" machines, while four are 26" machines. These are for cropping ends.

C. Six Threading Machines: Located in Bay 22 and in Bay 3 north of Bay 22, the threading machines were manufactured by the Pipe Machinery Company. The cutting heads are powered by electric motors; hydraulic-powered grips hold the pipe in place during threading.

D. Swing Grinding Station: Located in Bays 2 and 3 north of Bay 23, this facility includes an inspection table, a hydraulically-driven pipe rotator, and pneumatic, hand-operated grinding machines which remove surface defects. An End Facer and Belling Machine, once located in this area and associated with the processing of line pipe, have been removed.

E. Two Coupling Screw-on Machines: Located in Bay 23, these were manufactured by Fairfield. They are electrically-driven devices for applying couplings to pipe and tightening them to a specified torque.

F. Two Hydrotesters: Located in Bay 23, the older machine was manufactured by the Southwark Foundry and Machine Company. The recent (late 1970s) unit was manufactured by Yamasui. (The Yamasui unit was removed in November 1989, after the inventory was completed.) They consist of motor driven water pumps, pipe handling equipment including plugs, and orifices for delivering water to the pipe. The pipe is filled with water at 22,000 psi and checked for leaks.

G. Two Drifters: Located in Bay 23, these machines consist of metal bars approximately 30' long set in carriages which are thrust into the pipe by a small motor to remove threadings.

H. Scale: Located in Bay 23, this scale for weighing pipe was manufactured by the Toledo Scale Company.

I. Three Oiling Machines: Located in Bay 23 and in Bay 3 north of Bay 23, this equipment consists of a holding chamber and oil pumps where the pipe is coated on the outside with oil.

J. Transfer Car: Located in Bay 2 north of Bay 23, this motor-driven rail car transfers pipe to the shipping area.

Historic Name: U.S. Steel Corporation, National Tube Works, Main Pipe Mill, Seamless No. 1 Mill
Present Name: USX Corporation, National-Duquesne Works, Main Pipe Mill, Seamless No. 1 Mill
Location: Main Pipe Mill: Bays 1, 2, 4, 15 and the major parts of Bays 16, 17, and 18.
Construction: 1930
Documentation: Photographs of the Main Pipe Mill are located in HAER No. PA-380-A

DESCRIPTION

This mill utilized the Mannesmann double piercing process to produce rolled, seamless tubes with an O.D. (outside diameter) of 3-1/2" to 8-5/8". The mill is commonly divided into two parts. The hot mill, or hot end, includes the machinery used to form the pipe; the finishing end, or finishing floor, consists of machines that cut-off, thread, and test the product.

The capacity of the mill was 20,000 tons per month. The main product was drill and line pipe. The product was moved from machine to machine on a continuous roller line driven by small electric motors. The flow of the product was in the sequence presented below. Shipping facilities were located in part of Bay 19. Each bay was served by one or more electric overhead traveling cranes.

The mill is intact, with the exception of Cooling Tables #3 and #4, which have been dismantled. The hot end contains all original equipment.

I. No. 1 Seamless Hot Mill in Sequence:

A. No. 1 & No. 2 Billet Heating Furnaces: The two furnaces located in Bay 1 and the Billet Storage area north of Bays 14 and 15 are Chapman-Stein recuperative two-zone continuous heating furnaces. They are operated on either a 500 BTU mixture of coke oven and natural gas or on fuel oil. Each furnace has nineteen roll-down ports with counter weighted or chain-hoisted, vertically rising doors from which point billets are hand advanced. Pneumatic kick-outs move the billets to the discharge table. Each furnace is rated at 17 tons per hour. The main ancillary equipment includes a gravity-fed billet charging table, and a motor driven billet conveyor for moving billets to the individual furnaces. Billets, heated to a temperature of 2160 degrees F. are moved to the first piercer on a motor-driven hot billet conveyor.

B. No. 1 & No. 2 Piercers: Located in Bay 1 north of Bay 15, the Mannesmann-type piercers were manufactured by the Aetna Standard Engineering Company. They consist of two rolls, set side by side, inclined at opposite angles to the horizontal center line of the mill. The rolls revolve in the same direction at 95 rpm through a drive unit by a Westinghouse 2000 hp, 6600 volt, 25 cycle, synchronous motor. The roll setting or gorge is adjusted by a motor driven screw. The angle of inclination, or the bearing angle, is adjustable from 4 1/2 degrees to 11 degrees by a manually turned screw down system. The rolls create a fracture in the billet center into which a mandrel point is placed to enlarge and shape the cavity. Concave guide shoes located at the top and bottom of the pass at the exit end control the shell's O. D. The second piercer elongates the shell. Additional equipment for each piercer includes an internally water cooled mandrel bar upon which the mandrel or point is set. The mandrel bar is mounted on a thrust carriage that positions it on the exit end of the rolls. Ancillary equipment for each piercer consists of an air operated hot billet kickout for raising billets from the hot billet conveyor to the inlet table, an air operated billet ram for pushing billets into the rolls, and an outlet roll for moving the pierced billet or shell to the stripper block for removal of mandrel.

C. Reheat Furnace: Located in Bay 1, north of Bay 16, it is a single zone continuous heating furnace built by the Rust Engineering Corporation. It is operated on a 500 BTU coke oven and natural gas mixture. Charging and discharging of shells into the furnace is by air operated rams. Rolling of the shells across the hearth is performed manually with picker bars. The shells are conveyed to and from the furnace by motor-driven rolls.

D. High or Plug Mill: Located in Bays 1, 2, and 3, north of Bay 16, it was manufactured by the Aetna Standard Engineering Company. It is the return or reversing type in which the shell is returned to the entering side of the rolls for additional passes. It consists of a single two-high stand of working rolls and a pair of stripper rolls. The working rolls are driven through a direct drive unit by a Westinghouse 1000 hp, 6600 volt, 25 cycle, 79 rpm synchronous motor. The roll setting is adjusted by a motor driven screw. Rolls have 2 to 4 open pass grooves, though only one groove is used at a time. The shell is further elongated by this mill. Ancillary equipment consists of an internally water cooled mandrel bar upon which a plug is fitted, air actuated charging ram, and motor driven inlet and outlet tables.

E. East and West Reelers: Located in Bays 1, 2, 3 and 16, the two identical reelers were manufactured by the Aetna Standard Engineering Company. Construction of the reelers is similar to the Mannesmann-type piercers. They consist of two slightly tapered cylindrical rolls inclined at opposite angles, and permanently set at 6 degrees. The rolls are driven by 350 hp, 6600 volts, 25 cycle, induction-type Westinghouse motors. The reelers burnish the inside and outside diameters of the shell. The reelers alternate shells to maintain a high production rate. Ancillary equipment includes water cooled mandrel bars and motor driven inlet and outlet roller conveyors.

F. Seven Stand Sizer: Located in Bay 16, the sizer consists of seven stands of single groove, two-high rolls driven through reduction gearing by a variable speed, 350 hp, 6600 volt, 25 cycle Westinghouse induction motor. The stands are positioned 45 degrees to horizontal alternating right and left such that odd numbered stands are 90 degrees with respect to the even numbered stands. Roll settings are adjusted by a screw arrangement turned by a hand wheel. The sizer reduces the diameter of the shell to a standard size. Ancillary equipment consists of motor driven inlet and outlet roller conveyors.

G. Cooling Tables: Located in Bay 16, No. 1 & No. 2 Cooling Tables are intact, while No. 3 & No. 4 have been dismantled. These are roll-over tables, equipped with motor driven sprocket chains with projections to move shells over tables. Located on No. 1 is an automatic scale that measures pipe length and weight.

H. Straightener: Located in Bay 16, the six roll straightener was built by Taylor-Wilson. It consists of three pairs of cylindrical rolls positioned one over another at oblique angles forming an opening for the pipe to pass. The rolls are motor driven. Roll settings are adjusted by a motor driven screw-down. Ancillary equipment consists of motor driven inlet and outlet roller conveyors and a transfer table on the outlet side which changes the direction of the flow of the product from southward to northward.

II. No. 1 Seamless Finishing in Sequence:

A. Six Cutting-Off Machines: Located in Bay 17, two pair of cut-off machines were manufactured by Bardon & Oliver, the other pair by Taylor-Wilson. The rotary cutting heads are driven by an electric motor. Ancillary equipment consists of inlet and outlet conveyor roller lines, reject cradles and transfer tables.

B. Four Threading Machines: Located in Bay 17, they were manufactured by the Pipe Machinery Company. Two of the machines are positioned on the line, while two more have been removed and are stored nearby. The two in situ are housed in metal sheds. Ancillary equipment consists of inlet and outlet conveyor roller lines, reject cradles and a transfer table where the direction of the product is changed from northward to southward.

C. Two Coupling Screw-On Machines: Located in Bay 18, they were manufactured by Taylor-Wilson. The machines consist of a motor driven revolving head which screws the coupling onto the pipe.

D. Two Drifters: Located in Bay 18, these machines consist of metal bars approximately 30' long set in carriages which are thrust into the pipe by a small motor to remove threadings.

E. Two Hydrotesters: Located in Bay 18, these machines were manufactured by Hydropress, Inc. They consists of support framing, water orifices and Wilson-Snyder water pumps for filling the pipe with pressurized water for testing.

F. Two Oilers: Located in Bay 19, the equipment consists of a holding chamber and oil pumps which are used to coat the outside of the pipe with oil.

G. Grinding and Inspection Stations: Located in Bay 19, these areas are transfer and inspection tables where the pipe is inspected and any defects ground away by hand-operated grinding machines. The stations also provide a space for pipe to be stenciled and painted.

Historic Name:	U.S. Steel Corporation, National Tube Works, Main Pipe Mill, Submerged Arc Weld Mill (SAW Mill)
Present Name:	USX Corporation, National-Duquesne Works, Main Pipe Mill, Submerged Arc Weld Mill (SAW Mill)
Location:	Main Pipe Mill: Bays 7, 8, 9, 10, and portions of Bays 1 & 2 and the Billet Storage Bay.
Construction:	1950
Documentation:	Photographs of the Main Pipe Mill can be found in HAER No. PA-380-A

DESCRIPTION

The SAW Mill includes equipment for producing pipe in diameters from 24" to 42", with wall thicknesses between .250" to .750", and in lengths up to 41'. Stock for the mill is 1/4" to 1/2" steel plate obtained from the Homestead 160" Mill. The product was natural gas and oil transmission line pipe.

The mill consists of machines to form the steel plate into round "cans," weld them with an electric weld process where the welding arc is totally submerged in flux, and then to cold work, test and inspect them. The product is moved from machine to machine on a continuous roller-line, driven by small electric motors. The flow of the product from one machine to another is in the sequence presented below. Shipping facilities are located in part of Bay 10. Each bay is served by one or more electric overhead traveling cranes.

The SAW mill was intact and in good condition at the time of inventory. However, beginning in July, 1990, it has been partially dismantled and removed.

A. Transfer Table and Vacuum Crane: Located in Bay 7, the Pressure Grip Vacuum crane was manufactured by Whiting Corporation. The vacuum crane moves the steel plate to the transfer table where it is conveyed to the line.

B. Edge Planer: Located in Bay 7, the hydraulic and electric motor-powered edge shearer was manufactured by Birdsboro. It planes and bevels the edges of the plate to ensure that they are even for welding.

C. Edging Rolls: Located in Bay 7, this unit was manufactured by the Verson Allsteel Press Company. It is powered by two 100 hp GE induction motors and oil hydraulics. The rolls give a slight curve to the edges of the plate.

D. U-ing Press: Located in Bay 7, the 2000-ton press was manufactured by Verson. It consists of a steel housing 41' in length and conveyor rolls fitted with rounded ram dies on the top section and rounded rocker dies on the bottom, both powered by four hydraulic cylinders. The plate is forced into an "U" shape by the action of the dies.

E. O-ing Press: Located in Bay 7, the 18,000 ton press was manufactured by Hydraulic Press Manufacturers or HPM. It is similar in design and operation to the U-ing press. It forms the plate into an "O" form or "can."

F. Three Outside Diameter Welders: Located in Bay 8, the submerged arc welding machines are of unknown make. They are submerged twin-arc AC fusion welders. Linde welding rods and flux is used. The welding is done in a longitudinal guide located over the conveyor. During welding the electrode is not in actual contact with the plate; instead, the current is carried across a gap through a bed of flux laid down along the seam. Because satisfactory grounding can not be obtained on the pipe ends, the welding is done only to within 6" of the end of the pipe.

G. Two Squirt Welders: Located in Bay 9, these are portable welders positioned next to the conveyor line. They are used to attach a small steel plate at the end of the pipe at the point of the uncompleted weld, which permits inside welding of the entire length of the pipe.

H. Four Inside Diameter Welders: Located in Bay 9, these units are of unknown make. They are twin arc fusion welders, with a DC unit on the lead and AC on the trailing end. The welders are mounted on a cantilevered boom. The same type of welding is done here as the O. D. welders.

I. Upender: Located in Bay 9, this unit is of unknown make. It is a boom to raise pipe so that unused flux is removed. Also, there is a long tube with a vacuum attachment that cleans all deposits left after the welding operation.

J. Four Repair Welders and Two Inspection Tables: Located in Bay 9, two of the welders are SAE 900; the other two are SAE 600. The welders are used both to properly weld the outside diameter ends and to correct any welding defects found during inspection.

K. Two Fluoroscopes: Located in Bay 9 and Bays 2 and 3 north of Bay 9, these are of unknown make. They include a jacket for enclosing the pipe, a television camera, and control pulpit. They were used to check the pipe for defects.

L. Two Mechanical Expanders: Located in Bay 10 and in Bay 3, north of Bay 10, these units were manufactured by A. O. Smith. They consist of a steel framework and a hydraulic ram expander. The machines expand the pipe with hydraulic pressure, cold working the pipe and giving it its finished diameter, wall thickness, and desirable physical properties.

M. Pipe Scrubber: Located in Bay 2, north of Bay 10, it is of unknown make. It is a boom upon which a brush and rubber squeegee is mounted. It is used to clean the inside of the pipe.

N. Two Hydrotesters: Located in Bay 2, north of Bay 10, these hydrotesters are of unknown make. They consist of motor-driven water pumps, pipe handling equipment including plugs, and orifices for delivering water to the pipe. The pipe is filled with pressurized water and checked for leaks.

O. X-Ray Station: Located in Bay 1, north of Bay 8, this unit is of unknown make. It was used to x-ray the ends of the pipe for defects

P. Two End-Facers: Located in Bay 1, north of Bay 8, these units were manufactured by the Lincoln Machine Company. The machines consist of motor driven heads with facing tools to face and bevel the ends of the pipe and expanding arbors to hold the pipe in place during the operation. They were used to squarely face and bevel the pipe at right angles so that field welding could be done properly.

Q. Grinding and Inspection Tables: Located in Bay 1, north of Bays 9 and 10, these areas are where defects were removed by hand grinders and the final inspections were made.

R. Pipe Coating Machine and Inspection Tables: Located in an annex north of Bay 1, the machine is of unknown make. It was used to coat the inside of pipe with oil. Pipe were painted and inspected in this area.

Historic Name: U.S. Steel Corporation, National Tube Works, Electric Resistance Weld (ERW) Mill
Present Name: Camp Hill Corporation, ERW Mill
Location: 500' south of Monongahela River, and 600' west of

the Main Pipe Mill
Construction: 1962-64
Documentation: There are no photographs of the ERW Mill

DESCRIPTION

The Electric Resistance Weld (ERW) Mill produces pipe in sizes ranging from 8-5/8" to 20" diameter, with wall thicknesses from 0.172" to 0.375", and in lengths up to 80'. The product is used primarily for long distance transmission of natural gas, oil, gasoline and other petroleum products.

The facility is currently leased from USX by the Camp Hill Corporation and continues to produce. Nearly all the facilities date to the installation period 1962-64. Somewhat advanced at the time of installation, the technology is now standard in the industry.

I. ERW Mill Building Complex: The ERW mill is contained in a steel shed complex that measures 760' x 495'. The steel frame is covered with corrugated, galvanized metal on both the walls and roof. It is a one-story building, 42'-9" in height from the floor to the bottom chord of the roof truss. There is a clerestory and some additional windows on the gable ends. It has a concrete foundation and floor.

The complex is divided into five connected buildings: 1. the Shipping, 2. West Finishing, and 3. East Finishing buildings, each measuring 500' x 95'; 4. the ERW Building, measuring 650' x 95'; and 5. the Coil Storage Building, measuring 400' x 110'. Each building has an independent roof system with riveted Fink trusses and continuous ventilators mounted along the ridge. Each of the buildings has one or two EOT cranes.

II. ERW Equipment: ERW pipe is made from hot-rolled steel strip or skelp in coils, produced primarily at the USX Irvin Works.

The manufacturing process from raw coil to finished product entails 1. coil preparation, 2. forming, 3. welding, 4. sizing, 5. testing, 6. straightening, 7. cut-off, 8. facing, 9. finishing, and 10. shipping. Production takes place on a continuous processing line with both manual and automatic controlled motor-driven rollers.

III. Skelp Preparation:

A. Uncoiler and Peeler: Two horizontal cones fit into the eye of the coil. An adjustable, motor-driven roll on the top uncoils the coil. A stripper blade cuts the band of each coil and bends the leading end up to enter the pinch rolls.

B. Pinch Rolls and Flattener: The two pinch rolls are hydraulically adjusted. They pull the leading end forward and force it into the five flattener rolls, which remove any contours from the skelp.

C. End Shear: A guillotine-type shear cuts 6' to 8' off the entry and the exit ends of the coil to remove the off-gauge strip.

D. End Welder: An electric resistance welder joins the ends of the in-process coil with the new coil.

E. Looper: This is a storage area or accumulator that feeds skelp continuously to the mill while a new coil is being joined at the end welder. It will hold 400' of skelp.

F. Rotary Side Trimmers: These are tool steel knives that trim from 3/4" to 1 1/2" from each side of the coil.

IV. Pipe Forming:

A. First Forming Section: Four breakdown stands contain adjustable, individually-driven rolls. They contour the flat skelp into a "U" shape.

B. Second Forming Section: Three individually-driven stands, known as fin passes, complete the forming of the skelp into a circular shape.

V. Pipe Welding:

A. High Frequency Welder: This is the thermatool welding process in which a high frequency current of 450,000 cycles per second is introduced into the edges of the skelp by means of sliding contact tips. A seam guide roll holds the edges at a set distance apart. The welder heats the edges of the skelp. The squeeze roll assembly applies pressure on the pipe edges to cause forging.

B. Outside and Inside Diameter Bead Remover: A stationary carbide cutting tool mounted in a slide trims the outside diameter. A similar tool mounted on the end of a mandrel trims the inside diameter.

C. Shear Wave Ultrasonic Inspection: Two ultrasonic shear wave wheels continuously monitor the quality of the weld seam.

D. Three Induction Heating Units: These 350 kw capacity units have a frequency of 1000 cycles. They heat the weld seam to a normalizing temperature of 1750 degrees.

VI. Pipe Sizing:

A. Seven Stand Size: Four of the stands are motor-driven, three are idlers. The sizer imparts the correct outside diameter, ovality, and straightness to the pipe.

VII. Pipe Cut-off:

A. Flying Cut-Off: This unit is a movable cut-off machine that can traverse approximately 30'. It is controlled by a digital computer. It has four tool holders that can utilize either disc or carbide cutting tools.

VIII. Pipe Testing:

A. Two Hydrostatic Testers: Each of these units has a maximum test pressure of 5000 psi. Each is on a separate processing line. The pipe is filled with water and hydraulic pressure applied in order to test the weld.

IX. Pipe Straightening:

A. Six-Stand Straightener: This is a single-plane straightener that corrects bows and bends in the pipe.

X. Pipe Inspection:

A. Ultrasonic Weld Seam Inspection Unit: This is a manually guided shear wave probe unit which inspects the full length of the weld seam.

B. Electromagnetic Inspection Unit: This is an Amalog-make unit which uses the diverted flux principle to detect discontinuities in the weld and surface flaws in the body of the pipe.

C. Repair Grinding Table: Hand-held pneumatic grinders are used to grind the surface imperfections detected by the Amalog.

XI. End Facing:

A. Two End Facers: These two units are on separate processing lines. They are of the two-tool rotary type. They consist of a steel base supporting a sliding carriage and a hydraulically operated vice-type chuck. They face, ream, and bevel the pipe ends with carbide tools.

XII. Pipe Finishing:

A. Inspection Tables: The pipe is weighed, measured for length and stencilled with all pertinent production information.

B. Pipe Oiler: A sprayer deposits oil on certain types of pipe. Line pipe is not usually coated.

XIII. Shipping: The pipe is loaded directly into specially prepared railroad cars by McKeesport Connecting Railroad personnel and equipment. It is then transferred to the South Yard for shipping to customers.

HISTORY

The first tube mill at the National Plant was built in 1872. It was a 125' x 20' shop for making wrought-iron lap-weld pipe. In 1874 facilities for manufacturing butt-weld tubes were added. In addition to the oil and gas drill pipe and casing and transmission line pipe which became the main product in the 20th century, boiler tubes were manufactured. By 1893, when the McKeesport works began the transition from iron to steel, it was one of the largest industrial establishments in the country and the largest tube works in the world.

After the merger with US Steel in 1901, plans were initiated for the construction of a new tube and pipe mill. Initially, there were problems acquiring a tract of land adjacent to the existing works upon which to build the structure and other new facilities, but pressure from certain citizens of the town forced the 76 landowners to sell. By 1903 the National Tube Company had title to the 28 acres running from Center Street westward to Virgin Street. Construction began in early 1906. A November 8, 1906 Iron Age article described the ongoing work:

> ... in a short time the tube and pipe mill department will began the erection of what it is said, will be the largest mill building in the world, covering more than 20 acres of floor space, nearly every square foot of which will be served by an overhead electric traveling crane. This building, or series of buildings forming one, will be constructed of steel and brick, and will extend without a break in the roof covering, and will be 567 ft. wide. One portion, nearly a third of a mile long, will be covered by roof trusses spanning 158 ft. and at their centers carrying crane runways for 15-ton traveling cranes. The pipe welding furnaces and machinery for the production of sizes from 1/8

> in. to 36 in. diameter will be located in this portion of the building, while the balance of the space will be used for cooling tables, finishing and testing equipment and for stocking. The skelp will be handled directly from cars, and this operation, together with successive ones of charging, scarfing, bending, welding, sizing, straightening, cooling, stocking and shipping, will be accomplished by the use of the most modern machinery and labor saving devices, all operated by electric motors deriving their power from the central electric power house above described. Large areas have been reserved for stocking pipe for all sizes under cover.
>
> In the pipe mills, as elsewhere in the plant, arrangements are being made to minimize the exposure of workmen to heat and danger by placing the controlling levers and devices as far as possible from hot and dangerous machinery. Great attention has been given to the question of light and ventilation. The best possible arrangements for lighting the large building has (sic) been aimed at and entirely satisfactory results are expected. Fresh air will be taken from outside the building and blown directly on the men exposed to great heat, and large heating and ventilating systems have been installed for those parts of the building remote from the hot furnaces and pipe, so that it is expected that at all times as pure air and as comfortable a temperature will be maintained in such a large structure.

By the following year the Main Pipe Mill was completed, along with the Skelp Mills and several offices and shops on other parts of the twenty-six acre tract.

Originally, the Main Pipe Mill was 1548' long and 567' wide. It enclosed an area in excess of 21 acres. In 1911 an Iron Age article stated that it was "the largest building under one continuous roof in the world." The building housed twelve lap weld mills and six butt weld mills and produced tubes in diameters from 1/8" to 30", and in lengths up to 40'.

Despite the fact that the National Plant was the largest producer of pipe in the nation--and in fact the world--the pipemaking technology which was utilized in the Main Pipe Mill was not innovative. For most of this period, the National plant lagged behind other pipemaking facilities in technological advancements. The plant was one of the last in the nation to adopt the piercing process for making seamless pipe. However, there was one area in which it did lead the way. This was in the development of the "through-put" system of pipe production. According to a June 18, 1931 Iron Age article, the Main Pipe Mill was equipped with conveyors with "live rollers" to move pipe across the shop between operating units or processes, thus increasing the productivity and flexibility of the mill and limiting the use of cranes in moving the product. According to the article: "This method of handling pipe was developed by the National Tube Company about 15 years ago, and has proved most advantageous." Thus the "through-put" or continuous flow system, which was developed earlier in iron and steel making process at integrated mills, was pioneered at the National Plant during the 1910s for pipemaking.

In 1930, when the two seamless lines were installed, the building was enlarged with the construction of the Billet Storage Bay on the north side and the annexes on the south side. To make room for the Billet Storage Bay, ten gas producer plants were demolished.

The enlargement of the building and the installation of the two seamless lines and the upset equipment in the Main Pipe Mill, as well as other plant improvements, was initiated in June of 1929 and completed by the close of 1930. The seamless mills used the Mannesmann double-piercing process. The machinery was manufactured by Aetna Standard Engineering of Pittsburgh. The seamless mills replaced the ten lapweld mills in the Main Pipe Mill. The capacity of Seamless No. 1 was rated at 100,000 tons; No. 2 mill was rated at 150,000 tons. The reason for the change from lap-weld to seamless was not to increase capacity, but to produce a product that was rapidly gaining favor among the oil companies. Seamless pipe was favored for casing because it afforded greater resistance to the pressures of deep wells. Furthermore, it was cheaper to produce than lapweld pipe.

Following the major improvements in the early 1930s, the next period of expansion at the Main Pipe Mill took place during plant-wide modernization programs of the 1950s. In 1950, the SAW Mill was installed in the Main Pipe Mill, thus giving the National Plant a modern butt-weld facility to replace the antiquated butt-weld equipment removed from the building in 1946. The following year, Warm Working equipment was installed in Bay 15. The equipment consisted of a Warm Working Furnace, Sizer, and Cooling Tables. The equipment was removed in the late 1970s. (In this process, 5% oversized seamless pipe was taken from the hot mills and heated to a temperature about 100 degrees F. below the critical point, from 650 to 1000 degrees F. It was then passed through a five stand sizer to reduce the diameter, cooled on tables, and returned to the finishing floor. Warm working achieves nearly the same favorable mechanical properties in pipe as cold working, the main advantage being that it took less force or work to shape the steel.) The installations made in the 1950s, which included the No. 1 Quench and Temper Line (see Pipe

Heat Treating) were the last major changes in the Main Pipe Mill. The Electric Resistance Weld mill, added in 1962-4, was placed in a new building to the west.

The manufacture of butt-weld pipe was discontinued at the National Plant in 1936, mainly because seamless pipe in this size was generally superior and widely available. The Skelp Mills were shut-down in 1936, and all butt-weld facilities were moved to the Lorain Plant during World War II. Large diameter butt-weld pipe was produced at the Christy Park Plant with the Submerged Arc Weld (SAW) process, developed by the National Tube Company in the 1930s. Production was, however, suspended in 1932. In 1950, the National Plant was once again equipped to produce butt-weld pipe, this time large diameter pipe produced on a SAW line. The facilities expansion was made largely because of the rapidly expanding market for natural gas and petroleum-product transmission pipe.

The rapid growth of the pipeline market in the 1950s led the National Tube Division (National Tube Company, a subsidiary of U.S. Steel since 1901, was reorganized into the National Tube Division in 1951) to consider further expansion of its butt-weld capabilities. For this purpose, the division acquired a 6.96 parcel west of the National Plant from the American Sheet and Tin Plate Company, another division of U.S. Steel, in 1956. This parcel, known as the Wood's Works, contained mostly antiquated facilities for producing tinplate and stainless steel plate. In 1961, the National Tube Division acquired an additional parcel in this same area consisting of 22.02 acres from the Redevelopment Authority of McKeesport, Allegheny County.

The American Bridge Company and the Shiffler Bridge Company began construction of the new facility on October 5, 1962. The decision was made to produce medium diameter (8-5/8" to 20") butt-weld pipe and to utilize electric resistance weld technology. The ERW method was chosen because it was a proven, clean (no flux) technology. Furthermore, with recent improvements in high frequency AC welders, it was much faster than seamless or other butt-weld methods.

Another factor influencing the decision was a metallurgical development. The introduction of new high-strength steels (specifically the X-60 grade), which could readily be used as coil in the ERW technology, allowed ERW pipe to be produced with thinner walls. This meant less weight per length, a definite advantage to customers. Also the ERW pipe could be produced in greater lengths, as long as 80', with more uniform walls and a smoother internal surface.

The ERW Mill began production in November of 1964. At this time it was one of the most advanced pipe mills of this kind in the world, and according to the trade journal Blast Furnace and Steel Plant, it produced the longest pipe available.

Although no major changes were made in the Main Pipe Mill in the period between 1955 and 1977, several important improvements and renovations were made in the existing production lines. The only improvement made in the two seamless hot mills was the replacement of the billet furnaces in No. 2 Seamless with the Rotary Hearth Furnace in 1965. However, the two seamless finishing floors were altered substantially. On the No. 1 mill, three pairs of cut-off machines, two pairs of threading machines, and a coupling screw-on machine were replaced. The No. 2 mill was renovated with the replacement of three pairs of cut-off machines, two facing machines, and one pair of threading machines. The SAW mill received additional facilities for producing large O. D. pipe (from 36" to 42"), an additional fluoroscope, and an inside coating machine; in addition, the hydraulic expanding machine was replaced with two mechanical expanders. In the Upset Department, two upset presses in Bay 24 were replaced with one new unit. Also, five cranes were replaced and several of the crane runways were rehabilitated.

Between 1979 and 1981, in the wake of customer complaints and lawsuits about the quality of their oil country pipe, engineers at National initiated a quality control program. It consisted of the installation of additional non-destructive testing equipment on the Seamless No. 1 & No. 2 mills, including the replacement of the hydrostatic tester at No. 2 with a Yamasui hydrotester and the installation of Amalog electromagnetic testing machines (AMF Tuboscope) on the two seamless and the No. 1 Quench and Temper line. In addition, U.S. Steel contracted with the Sumitomo Metal Industries, Ltd. plant engineering firm from Osaka, Japan to examine pipemaking facilities at the National and Lorain Plant and make recommendations for improvement. In their report, Sumitomo set-out re-arrangement plans for Seamless No. 1 & No. 2, and No. 1 Quench and Temper lines. As a result, the finishing floors of both seamless lines were altered, the cutting-off and threading machines were relocated, No. 1 Quench and Temper line received Stamet threading machines, and a cut-off machine from the seamless No. 1 line was also relocated.

Production at the Main Pipe Mill was curtailed in 1982 and shut down completely in 1984. In 1987 the ERW Mill, along with the rest of the National Plant, was shut-down. However, two former employees of USX, Al Hilleglass and Pat Campano, joined in December 1987 to form the Camp Hill Corporation. The purpose of the corporation was to re-open the ERW mill, as well as other facilities at the National Plant if the market situation so warranted. An agreement was reached with USX whereby USX would furnish the facilities, raw materials and markets, and Camp Hill the capital, management of the operation, and labor. An agreement also was reached with the United Steel Workers of America whereby the operations remained a union shop. The mill was returned to production in February, 1988.

Currently, the Camp Hill Works employs 150 men, many of them former USX employees. The mill produces about 400 tons of pipe per turn and works 10 turns per week.

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There are three quench and temper heat treating lines, as well as two normalizing lines at the National Plant. No. 1 Quench and Temper, for small diameter pipe, is the oldest, having been installed in the Main Pipe Mill in 1955. No. 2 Quench and Temper line is for larger diameter pipe, especially oil well casing. Located in the former 13" Mill Building, it is a "state-of-the-art" facility built in 1980. No. 3 Quench and Temper was put on-line in 1982 as a result of an upgrading of the No. 2

Normalizing Line. Designed solely for drill pipe, it was used only for a one week trial run. It is located in the former 16" Mill Building. All three Quench and Temper (Q & T) lines are 90% to 95% intact.

No. 1 Normalizing Line, located in the Upset Department of the Main Pipe Mill (see Pipe Making section), was used to heat treat small diameter pipe. Used primarily for line pipe, it was obsolete by the 1960s. It is partially intact. No. 2 Normalizing Line, installed about 1960, was integrated into the No. 3 Q & T line in 1982.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, Main Pipe Mill, No. 1 High Strength Line
<u>Present Name</u>: USX Corporation, National-Duquesne Works, National Plant, No. 1 Quench & Temper Line
<u>Location</u>: Main Pipe Mill: portions of Bay 1, 2 and 3 and the major part of Bays 12, 13, 14, and 15.
<u>Construction</u>: 1955
<u>Documentation</u>: Photographs of the Main Pipe Mill can be found in HAER No. PA-380-A

DESCRIPTION

No. 1 Q & T was used for heat treating and finishing casing, drilling, coupling, and lining pipe between 3-1/2" and 14-3/8". Its capacity was 40 tons per hour and 173,000 finished tons per year. The product sources were the No. 1 & No. 2 Seamless Mills at the National Plant, and No. 4 Seamless Mill at the Lorain Plant.

The product was moved on a continuous roller-line driven by small electric motors. The flow of the product was in the sequence presented below. Each bay was equipped with one or more electric overhead traveling cranes.

I. <u>No. 1 Quench & Temper in Sequence</u>:

A. <u>Portable Induction Coil Furnaces</u>: A total of fifteen 2400 volt, Westinghouse preheating furnaces are located in Bay 13 on top of the Instrument House. During operation these were placed in front of the walking beam furnace and were used to preheat the pipe to 850 degrees before it entered the furnace.

B. <u>Walking Beam Furnace</u>: Located in Bay 13, the box-type furnace constructed of metal and refractory firebrick was manufactured by Salem. It is a recuperative, continuous furnace fired by natural gas. Pipe is charged into the furnace by a motor-driven roller conveyor line, and moved across the furnace by the walking beam. It raises the temperature of the pipe to 1550 degrees F.

C. Quencher Units: Located in Bay 13, the external spray quench rings are approximately 2'-6" in diameter and have hundreds of water jets for delivering water to the heated pipe in order to harden it. A cinder block Instrument House contains three Morris pumps and three Johnson Vertical pumps with 300 hp Allis-Chalmers induction motors for delivering 9000 gpm quench water at 120 psi to the pipe, which is quenched to a temperature of 200 degrees F.

D. Cooling Table: Located in Bay 13, the roll over table, equipped with motor-driven sprocket chains with projections to move pipe, cools and marshals pipe before tempering.

E. Portable Induction Coil Furnaces: Located in Bay 13 on the charging side of the tempering furnace, these units are identical to those described above. They raise the temperature of the pipe to 700 degrees F.

F. Tempering Furnace: Located in Bay 13, the Surface Combustion Corporation recirculating furnace is natural gas fired. It is steel plate and refractory brick construction. Pipe is moved through the chamber by motor-driven chains. It raises the temperature of the pipe to 1000 - 1240 degrees F. thereby restoring ductility.

G. Sizing Machine: Located in Bay 13, this five stand sizing mill was manufactured by Aetna Standard. It is driven by a 1,000 hp General Electric sychronous motor with hydraulic screw-down. The mill reduces the outside diameter of the pipe to a standard size. It includes ten spare stands of rolls and numerous spare rolls of various sizes are stored nearby.

H. Cooling Tables: The first cooling table is located in Bay 13, the second in Bay 3, north of Bay 13. They are roll-over tables, equipped with motor-driven sprocket chains with projections to move pipe over the tables.

I. Bar Conditioning Floor: Located in Bays 1 & 2, north of Bay 13, this area is devoted to servicing mandrel bars and plugs used in the Main Pipe Mill. The c. 1950s equipment consists of two plug lathes, an 18" bar lathe, a straightener and a 48" x 60" bar lathe.

J. Rotary Straightener: Located in Bay 12, this seven roll unit was manufactured by the Sutton Engineering Company. The rolls are driven by a 400 hp General Electric DC motor. Roll adjustments are made by hydraulics.

K. Gag Straightener: Located in Bay 12, this unit was manufactured by the A. B. Farquhar Company, a division of Oliver Corporation. The two straightening arms are powered by an electric motor; the pipe was held in place by a hydraulic press during the operation.

L. Magnaflow Inspection Unit: Located in Bay 12, this unit was manufactured by Magnaflux Corporation. It consists of a metal shed and pipe handling equipment, pumps for spraying a solution of water containing ferrous oxide on the pipe, an electrical device for magnetizing the pipe, and a black light for examining pipe. The purpose of the unit was to detect surface defects on the pipe.

M. Inspection and Grinding Stations: Located in Bay 12, the two stations consist of inspection tables set on wood floors with hydraulically-driven, pipe rotating equipment and portable pneumatic grinders to remove surface defects.

N. Two Cutting-off Machines: Located in Bay 12, the two machines were manufactured by Taylor Wilson. They are fitted with carbide cutting bits and are motor driven. They were used for cropping the ends off pipe.

O. Four Threading Machines: Two Stamet-made threaders are located in Bay 11, and in Bay 3 north of Bay 11, while two Taylor Wilson threaders are located in Bay 11. The cutting heads were powered by electric motors, while hydraulic-powered grips held the pipe in place during threading.

P. Coupling Screw-on Machine: Located in Bay 11, it was manufactured by Taylor-Wilson. It was an electrically-driven device for applying couplings to pipe and tightening them to a specified torque.

Q. Drifter: Located in Bay 11, the Drifter is attached to the end of the Coupling Screw-on Machine. It is a metal rod approximately 30' long set in a carriage. It was pushed into pipe by a small electric motor to remove threadings.

R. Two Hydrotesters: Located in Bay 11, the two hydrotesters were manufactured by Taylor-Wilson. They consist of motor-driven water pumps, pipe handling equipment, and orifices for delivering water to the pipe. The pipe was filled with water at 22,000 psi and checked for leaks.

S. Inspection Stations: Located in Bay 11, these are transfer tables and storage racks where pipe was subjected to a visual inspection, stenciled, and capped to protect the threads.

Historic Name:	U.S. Steel Corporation, National Tube Works, 13" Skelp Mill, No. 3 Billet Peeler & Storage Building
Present Name:	USX Corporation, National-Duquesne Works, No. 2 Quench & Temper Line
Location:	13" Mill Building, about 400' south of the Monongahela River, and 250' east of Main Pipe Mill
Construction:	1906 for building, 1980 for No. 2 Quench & Temper
Documentation:	Photographs of the 13" Skelp Mill can be found in HAER No. PA-380-B

DESCRIPTION

Facilities for heat-treating seamless pipe, mainly for high-strength drill casing--in sizes 7" through 24" outside diameter, in lengths up to 48', and in wall thicknesses up to 1 1/4"--are located in this recently renovated building. The building is a consolidation of the former 13" Skelp Mill, the former Skelp Mill Annex, and the Skelp Mill Water Treating Plant.

The product was moved from machine to machine on a continuous roller line driven by small electric motors. The production line is approximately 90 percent intact.

I. 13" Mill Building:

Overall, the building measures 520' x 150' and is approximately 45' from the floor to the bottom chord of the truss. It is a steel frame structure with corrugated, galvanized-steel wall and roof coverings. The foundation is concrete; the floor is concrete with some areas of wood. It is composed of two sections, each with a separate roof system. The former 13" Skelp Mill constitutes the south section, and the former Skelp Mill Annex and Water Treating Plant, consolidated under one roof, make up the north section.

This north section measures 488' x 50'. The east and north walls are brick to a height of about 12', topped by corrugated metal to the roof; the east gable wall, which is the west wall of the Skelp Mill Water Treating Plant Pumphouse, is entirely brick. There are vehicular doors along the north wall on the first story and a clerestory above with rectangular window openings fitted with translucent, green fiberglass. The roof, which appears to be recently built, has a monitor, and is supported by a riveted Pratt trusswork. The steel frame supports a craneway upon which is a 10-ton crane.

The south section is all metal and measures approximately 520' by 100'. It has a clerestory fitted with green, translucent fiberglass on the east and south side. The monitor roof is supported by a modified Fink truss with riveted connections. The roof covering is corrugated metal. The steel frame supports two 15-ton cranes.

The Pipe Transfer Yard, formerly the Skelp Storage Yard or Slab Yard measures 500' x 140' and is located west of the 13" Mill Building. Two overhead craneways are supported by free-standing steel columns. Upon the craneways are three 25-ton, EOT cranes. Located in the yard are also the entry and exit conveyor lines and transfer tables for the No. 2 Q & T line. The entry and exit roller conveyor lines are chain-driven by 15 hp, AC motors. The transfer tables are pneumatically powered.

II. <u>No. 2 Q & T in Sequence</u>:

A. <u>Hardening, Walking Beam Furnace</u>: This is a box-type, continuous furnace manufactured by Loftus. It is made of steel frame with heavy steel plate walls, floor and ceiling. It has a full basement in which motors, gear reduction drives, connecting rods and a massive steel carriage for the walking beam are located. It is a ten-zone furnace and is fueled exclusively by natural gas. It is equipped with recuperators supplied with fresh air by a blower fan powered by a 25 hp, AC motor. The steel carriage, with 2' wide "I" beams, both lifts and imparts a slight traverse motion to the walking beam chain in the main furnace chamber. The lifting motion is generated by a 75 hp, 1750-2000 rpm, 500 volt motor. The traverse motion is supplied by a Robinson 10 hp, 1750/2300 rpm motor. The furnace chamber contains the scalloped, alloy walking beam; it is lined with refractory brick and asbestos. The east and west sides are fitted with counter-weighted doors for manipulating pipe. The furnace is used to heat the pipe to a temperature of about 1650 degrees F. to form austenite, a hardened form of steel.

B. <u>Quench Facilities</u>: The quench chamber, a steel frame structure approximately 24' x 12', with walls and a removable roof made of steel plate, was manufactured by the Munroe Company. Inside the quench chamber is a quench ring, fitted with numerous water sprays, that is 20' long with an opening 12" to 18" round. On standby are two additional rings, giving the unit the capacity to quench pipe in sizes 7" to 24". Attached to the ring inside the chamber are six water headers, three that connect to the top half of the quench ring and three for the bottom. The coldwell water pumps and motors have been removed. A flow regulation station with three Hydril surge absorbers (pulsation dampeners with diaphragms) and Jamesbury pneumatic valves, is intact. The hotwell or spent water pumps are missing; remaining at the hotwell station are four water tanks with Lakos Separators, manufactured by the Claude Laval Corporation. Two concrete, descaling pits, the first 8' x 24' and the second 8' x 8', are located nearby for gravity separation of scale. Another 24' x 8' concrete pit is for collection and storage of dry scale. The quench facilities rapidly cool the austenitic steel pipe with high pressure blasts of water in order to freeze it and form a microstructure called martensite.

C. Cooling Table: This steel frame, measuring 60' x 40', is equipped with hydraulic transfer arms and a electrically-driven continuous chain for moving the pipe. Here, the pipe is cooled and marshalled for the next operation.

D. Control Room: East of the cooling table is a pentagram-shaped pulpit in which the control panels, and television and computer monitors to control the line are used. Controlled factors include the furnace temperature, pipe movement and metallurgical characteristics.

E. Tempering, Walking-Beam Furnace: This is a continuous box-type furnace manufactured by Salem that is approximately 68' x 52'. The furnace structure is steel frame with walls, floor and ceiling made of sheet steel. It has a concrete-lined basement and concrete foundation. The walking beam system operates in a similar manner as the Loftus furnace, described above. The steel carriage is, however, smaller than that of the Loftus, the "I" beams measuring 10" thick. The carriage is lifted by a 150 hp, 550 rpm, General Electric DC motor. The traverse motion is provided by a 7.5 hp, 900 rpm GE DC motor. The furnace chamber contains the scalloped, alloy walking beam; it is lined with refractory brick and asbestos. The east and west sides are fitted with counter-weighted doors for manipulating pipe. The chamber is divided into three major firing zones and each firing zone is divided into four control zones. The furnace burns natural gas exclusively. Twelve recirculating fans are located on top of the furnace; they are Robinson fans, size 48, each powered by a GE, Severe-Duty, 30 hp, 1765 rpm motor. The combustion air fan is a 36" Robinson intake fan powered by a GE Severe-Duty, 75 hp, 1775 rpm motor. The steel plate, refractory brick-lined stack for venting the waste gases from this and the Hardening Furnace is approximately 80' tall and 12' in diameter. It is located 40' north of the No. 2 Quench & Temper Building, 56' east of the water cooling tower. The tempering furnace heats the pipe to a temperature of around 1000 F to 1200 F in order to restore ductility to the martensite steel.

F. Three-Stand Sizing Mill: This is a universal sizer manufactured by Ween United Meer. The three stands of sizing rolls are positioned on movable cars that are fixed on rails; they can be interchanged with three identical, car-mounted spare stands located nearby. To the northeast are several racks of spare sizer rolls of various sizes. The sizer rolls are powered by a 1250 hp, 800 rpm, 2300 volt Siemens-Allis induction motor. The roll stands have electric screw-downs powered by Siemens-Allis, 7.5 hp, 1775 rpm motors. The movable cars are hydraulically powered by Vickers pumps and accumulator. The sizer reduces the pipe, which has been slightly expanded in the tempering furnace, to a uniform outside diameter.

G. Secondary Quench Area & Cooling Table: The quench area is enclosed by metal plate walls with no roof. The quench unit itself, along with pumps, has been removed. The Cooling table, located at the eastern end of the building, is 60' x 40' with five steel runners. It is covered by a steel grate and fitted with an electrically-driven continuous chain for moving pipe. There are water sprays on its north side and a pit below for collecting waste water and scale. The waste water pumps for these operations have been removed.

H. Five-Roll Straightener: Manufactured by Sutton, this unit includes inlet and outlet conveyor tables. The straightener rolls are powered by a GE DC, 600 hp, 400-1200 rpm, 500 volt motor. The entry and exit rolls are mounted on pivot arms, allowing the operator to adjust the distance between them; the screw-down mechanism for each is powered by Reliance Duty-Master AC, 7.5 hp, 1775 rpm motors. The position of the pivot arms is also controlled by hydraulic rams. The straightener has a Farval lubrication system and a coolant system. The straightener is used to remove bows and other irregularities caused by the heating.

I. Inspection and AMF Tuboscope Testing Area: Located in the north bay, these facilities include an inspection table, a three stand, Fairfield Pinch-Roller unit, and the AMF Tuboscope, Inc., Amalog electromagnetic scanning device and sonoscope. In working condition, this unit consists of three parts: a Console with Magnetizer and Control Panel, a Positioner, and an Off-Line Calibrator. However, the Positioner has been removed. The Amalog performs two types of inspections. First, the Amalog sensing head rotates around the moving pipe, magnetizing it, thereby creating a flux field through which an electric current is passed. Any discontinuity in the pipe, such as a seam or longitudinal surface defect, alters this electric current. The current is metered and any changes noted. The second inspection is by the sonoscope, which transmits sound waves through the pipe in order to detect transverse surface defects and internal pits. The exact location of any discontinuity detected by either process is recorded and transmitted to a movable arm located near the exit of the pinch-roller. The movable arm, acting on this information, activates a spray-paint can which marks the flaw.

J. Inspection and Grinding Areas: One inspection table, equipped with Magnaflux particle inspection equipment, and three grinding tables are located in the north bay east of the testing area. The tables are sets of steel runners, positioned 1'-6" high and arranged so that inspectors may move around them. The floors in the table area are wood platforms raised 6" off the concrete floor. The four tables are equipped with pneumatic pipe rotators. The three grinding tables are furnished with pneumatic valves and controls from which pneumatic, hand-held, rotary-wheel grinders are powered. On the inspection table the pipe is charged with an electric current by the magnaflux unit. Inspectors apply iron filings to the paint-marked areas. Filings accumulate on the surface defects indicating the exact location and configuration of the defect. These are marked by the inspector. The grinder, using the pipe rotator, then grinds the defects free. From this point, the heat-treated pipe is transported to the No. 2 Seamless Finishing Floor in the Main Pipe Mill for further processing.

K. Scrap Collection/Exit Conveyor Line: At the door on the west end of the north bay is an elevated, narrow gauge rail line mounted on a steel structure measuring 35' x 8' and elevated to a height of about 12'. The structure extends into the exterior area. A scrap car for collecting reject pipe rides on this rail line. The car is moved along the rail to an outside area by a pulley and cable arrangement. Once outside, the car is unloaded by the Pipe Transfer Yard crane.

L. Water Cooling Tower: Approximately 40' north of the Skelp Mill Building are the facilities for cooling and recycling hot water from the quenching operation. The Cooling Tower is approximately 80' x 18'. It is 20' tall with 2 levels. The first level houses the concrete water tanks, while the top level is wood frame covered with plywood decking. Wood steps, and an ornamental gate are located on the west side. The four towers, spanning both levels, are fiberglass and 20' in diameter. Each is fitted with water spray nozzles and a 16' diameter fan driven by a 60 hp, AC motor. Inside, spanning the entire length of the towers below the fan, are panels hung like Venetian blinds to deflect the flow of the water and disperse heat into the atmosphere.

M. Pump Houses: These facilities serve both the #2 Q & T and the #3 Q & T Line in the adjacent 16" Mill building.

1. Skelp Mill Water Treating Plant Pumphouse: Built in 1906, the pumphouse is a 125' x 50' buff-colored, common-bond brick building. It has arched windows and a gable roof covered with corrugated metal sheeting. It is devoid of equipment.

2. Cooling Tower Pumphouse: This pumphouse is a 36' x 16' cinder block structure located on the east side of the tower.

3. Fire Service Pumphouse: This 40' x 12' pumphouse is located east of the water cooling tower, and is used for fire control.

Historic Names:	U.S. Steel Corporation, National Tube Works, 16" Mill Building, No. 2 Normalizing Line
Present Name:	USX Corporation, National-Duquesne Works, 16" Mill Building, No. 3 Quench & Temper Line
Location:	230' south of the Monongahela River, and 240' east of the Main Pipe Mill, McKeesport, Allegheny County, PA
Construction:	1906 for building, c. 1960 for No. 2 Normalizing Line, 1982 for No. 3 Q & T
Documentation:	There are no photographs of the 16" Mill

DESCRIPTION

Facilities for heat treating drill pipe were augmented in 1982 when the induction heating line from the Torrance (California) Works was moved to the National Plant and incorporated into the No. 2 Normalizing Line. The No. 3 Q & T Line was the result. It was designed with the capability of heat treating 31,000 tons of drill pipe per year.

I. 16" Mill Building: The building measures 520' x 80' and is 33'-5" from the floor to the bottom chord of the truss. It is a steel frame structure with corrugated steel walls and roof covering. The monitor roof is supported by modified Fink trusses. There is a clerestory with translucent fiberglass windows. The building has a concrete floor and foundation. It is equipped with a 10-ton and a 20-ton crane.

II. Equipment in Sequence:

A. No. 3 Quench & Temper Line: This equipment consists of three Westinghouse induction furnaces, a water quench and descaling unit, and charging and discharging tables fitted with roller conveyors. The quench water was cooled in a Water Cooling Tower located on the north side of the 16" Mill Building.

B. No. 2 Normalizing Line (integrated with #3 Q & T): The tempering furnace (formerly normalizing) is a continuous, natural gas fired unit with five heating zones. It is equipped with an electrically-driven internal conveyor, a charging conveyor, discharge conveyor, and cooling beds. Two gag straighteners, the first vertical and the second horizontal, manufactured by the Elmes Co., complete the line.

HISTORY

I. Buildings Housing the Heat Treating Lines:

The 13" and 16" Skelp Mill Buildings and the Water Treating Plant were built in 1906. The Water Treating Plant included a Pump House, a Soda House and Purifying Tanks. This plant was used until the early 1970s. The Pump House, along with parts of the brick walls of the Soda House, remain from this plant. (See Steam Generation System, History of Boiler Feed Water Plants for additional information.) The 13" and 16" Skelp Mill Buildings originally had iron roofing and siding, which were later replaced. The 13" and 16" Skelp Mills (see Rolling Mills, History) were shut-down in 1936 and dismantled in 1946. The 13" Mill Building was then used to house the No. 3 Billet Peeler, and also for storage.

II. Heat Treat Lines:

The No. 1 Normalizing Line was installed in 1930, along with the Upset Department in the Main Pipe Mill. As the demand for tubular goods increased, and as oil wells were drilled deeper in the 1950s, the No. 1 Quench and Temper Line was installed in 1955 to produce a stronger product. However, simple normalizing continued to be employed for other products with less rigorous applications. No. 2 Normalizing Line was added in c. 1960 for small diameter pipe.

A strong market for deep-well oil products in the 1970s led to the construction of the No. 2 Q & T. In 1979 plans were announced to build a "world class" facility, and by 1981 it was put on-line for a cost of $ 50 million. As the demand for tubular goods soared in the early-1980s, the No. 3 Quench & Temper Line was created in 1982 by transferring heat treating equipment from the Torrance, California plant to the National Plant. This line was used for only one week, a trial run in March, 1982. It was decided not to put the line into full production because of the collapse in the oil and gas market at this time. This occurrence also led to the shut-down of No. 1 Q & T in the same year and No. 2 Q & T in 1984.

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STEELSHAPING - COUPLING MAKING

Couplings were produced at the Coupling Blank Building, where blanks were cut from seamless pipe, and the Coupling Tap Building, where the blanks were threaded and electroplated. Both production lines have been partially dismantled.

The Coupling Blank Building, formerly the Foundry, includes the intact Babbitt Shop and the dismantled Tin Shop. In addition to the coupling finishing lines, the Coupling Tap Building contains the API Master Threading Gauges, and pipe and coupling testing equipment, including a collapse tester presently used by a subcontractor to test ERW pipe from the Camp Hill Corporation and the USX Fairfield Works.

<u>Historic Name</u>:	U.S. Steel Corporation, National Tube Works, Iron and Brass Foundry
<u>Present Name</u>:	USX Corporation, National-Duquesne Works, Coupling Blank Building and Babbitt Shop
<u>Location</u>:	950' south of the Monongahela River, and 40' west of the Main Pipe Mill, adjacent to and north of the General Machine Shop
<u>Construction</u>:	1908
<u>Documentation</u>:	Photographs of the Coupling Buildings can be found in HAER No. PA-380-E

DESCRIPTION

I. <u>Coupling Blank Building</u>:

The building measures 340" x 108' and is a steel frame structure with common-bond brick walls, and concrete foundation and floors. There are large rectangular windows on the gable ends and a clerestory; the windows have what appears to be original glass and sash. The monitor roof is covered with sheet metal.

The building is divided longitudinally into two bays: a one-story central bay 64' wide, and a two-story side bay 42' wide attached on the north side. The main bay has a crane runway and clerestory; it is 40' high from the floor to the bottom chord of the truss. The monitor roof is supported by Fink trusswork. The two-story side bay is 26' from the floor to the bottom chord of the truss. The lean-to roof slopes toward, rather than away from the main bay. It is supported by a Howe half-truss.

There are two crane runways and storage yards. The one on the west side of the building is the Flask Yard; on the north side is the Lumber Storage Yard.

II. Coupling Blank Equipment:

A. Three 26" Cut-off Machines: Located in the main bay, these are electric and oil hydraulic cut-off machines manufactured by the National Tube Company. They were installed in 1930.

B. Four 8" Cut-off Machines: Located in the side bay, these are electric and oil hydraulic cut-off machines made by Bardons Oliver. They were installed in 1937.

C. Grinder: Located in the side bay, this is a dual wheel, 12", motor-driven pedestal grinder. Its manufacturer and installation date are unknown.

D. Cut-off Saw: Located in the side bay, this is a motor-driven unit with a 12" blade. It was manufactured by Rockwell-Delta. The installation date is unknown.

E. Drill Press: Located in the side bay, this 1/2" floor stand drill press and table was manufactured by Rockwell. Its installation date is unknown.

F. Edging Machine: Located in the side bay, the floor mounted unit has a 4" wide belt. The manufacturer and installation date are unknown.

G. Babbitt Shop: Located in the southwest corner of the side bay, it contains a Trent Electric Furnace, installed in 1960; a United American Babbitt Heater installed in 1963; a Rockwell Hardness Tester installed in 1924; a Zero Shot Blast Machine installed in 1901; an American Gas Furnace installed in 1901; two Brown-Sharpe Gas Furnaces installed in 1912; and an Advance Gas Furnace installed in 1923.

H. Tin Shop: Located on the second floor of the side bay, it was dismantled and the machines sold at an auction at the National Plant on April 17, 1990. Most of the equipment was manufactured about 1940.

Historic Name: U.S. Steel Corporation, National Tube Works, Coupling Tap Building
Present Name: USX Corporation, National-Duquesne Works, Coupling Tap Building
Location: 540' south of the Monongahela River, 45' west of the Main Pipe Mill, and north of Boiler Shop
Construction: 1909

Documentation: Photographs of the Coupling Buildings can be found in HAER No. PA-380-E

DESCRIPTION

I. Coupling Tap Building:

The building is "L" shaped and composed of two wings, a south wing that measures 180' x 80' and a 480' x 90' west wing. It is approximately 40' high from the floor to the bottom chord of the truss. It has buff-colored, common-bond brick walls, and some areas of steel sheet walls. It has concrete foundations and mostly concrete floors, with some wood flooring. The monitor roof is supported by Pratt trusswork, and is covered with corrugated metal. The building supports four EOT cranes--a 5-ton Alliance installed in 1912, and three 5-ton National Tube Company units installed in 1909.

The south wing is devoted to testing and houses the Master Gauges, while the west wing is devoted to coupling. Approximately one-third of the west wing is metal-clad rather than brick. The west wing has a shop floor and clerestory. The south wing has a shop floor and a second story with storage and office space.

There are three small annexes and three ancillary buildings located adjacent to the main building. Attached to the south wing on the west side are the, 1. electrical storage addition, a two-story, steel-shed structure that connects the west wing to the Boiler Shop; 2. the air compressor annex, a one-story brick building and compressor; 3. heating fan-electroplating lab, a one-story brick annex attached to the west wing on the south side.

Small, free-standing, auxiliary brick buildings that are located within the "L" shaped enclosure are, 1. the Coupling Department office, a one-story brick structure; 2. a one-story, brick sanitary facility; and 3. the Pump Station, a free-standing, concrete-block building that appears to have once been a garage.

II. Pipe Testing and other Equipment in the South Wing:

A. API Master Threading Gauges: Located in an interior, white-washed, cinder-block building known as the Master Gauge Room, these are standard US Bureau of Standards-approved threading gages for various sizes of pipe and couplings. An electric, Ex-cel-o Contour Projector is also in the room, being a means of transferring the master gages to plant field gages. The

Master Gauge room is at a constant-temperature, and is equipped with a fire station.

B. Two Air Compressors: One is an older, Rotaryvane air compressor with an 85 psi output, and the second is an electric, Ingersoll-Rand, two-stage, automatic, high-capacity compressor with 150 psi output.

C. 600 Ton Tensile Test Machine (TM 1): This is a 30' long steel and concrete structure with two hydraulically-powered gripper heads that pull and twist the test item, which was mostly coupled pipe, but also included steel cables. Hydraulic power is provided by an emulsified mixture of brine and oil, pumped at high pressures by an electric, Kobe Triplex pump and maintained by an accumulator. Installed c. 1950s.

D. Make-up Machine: Manufactured by Riehle, this was used in association with the TM 1. It includes two rotating, electric-powered gripping heads and a Wright Jib Crane. It is a screw-on machine that tightens pipe and couplings to an exact torque. Installed c. 1950s.

E. Two Ringtesters: These are pipe collapse testers, one for smaller diameter pipe (up to 24") and the second for larger diameter. There are steel housings in which a 4" wide slice or ring of test pipe is placed and subjected to compression by air, in the case of the smaller unit, or emulsified water. Installed c. 1950s.

F. Fatigue Tester: This is a high pressure hydrotester with an electric Aldrich Pump. Installed c. 1930.

G. Two Baldwin Rotating Beam Fatigue Testing Machines: Manufactured by Sonntag Scientific Corporation, these machines are electrically-driven gripping and twisting heads for testing couplings. Installed c. 1940.

H. Gas Leak Tester: This device, a metal shed chamber with gas and water orifices and monitoring equipment, was designed and built by National Works engineers to check pipe for leaks under simulated field conditions. Installed c. 1950s.

I. Collapse Tester: Manufactured by the Ritter Engineering Company, this unit is comprised of a chamber in which a steel cylinder and electric oil pumps are located. A piece of 27" long pipe is placed in the cylinder and subjected to hydraulic pressure. The unit is currently used to test electric resistance weld pipe from Camp Hill Corporation and USX's Fairfield Plant. Installed c. 1960s.

III. Coupling Finishing Equipment in West Wing: The following facilities are for threading and electroplating couplings. There are recently disturbed areas in this wing indicating the recent removal of several pieces of equipment.

A. Vanishing Machine: Manufactured by the National Tube Company, this is an electric unit that handles couplings 4" to 12-1/2" in diameter. Used to burnish the end of couplings prior to threading, it was installed in 1909.

B. Two Face-Recess Machines: Manufactured by the National Tube Company, these are driven by electric motors. They end-face couplings in sizes from 6-5/8" to 24". They were installed in 1938.

C. Electroplating Facilities: This equipment is located in the west wing of the building, and in the adjacent exterior area. It is an automated plating line for couplings manufactured by Hanson-Van Winkle-Munning, and installed in 1978. It handles couplings 4-1/2" to 20" in diameter, plating them with either zinc or tin. It is an "in line," tank plating line with two overhead automated transfer hoists for the racks for dipping couplings into plating tanks. There are fifty-six racks, forty-eight rack hangers, rectifiers, and anodes in the building, zinc and tin recirculation system facilities in the Electro-Plating Lab Annex, and an air exhaust system, and zinc and tin solution tanks in the exterior area. Also outside are storage tanks for pickling solution.

D. Coupling Bore and Tap Machine: Manufactured by Cridan, this unit handles couplings in sizes 9-5/8" to 20" diameter. It is a numerically controlled threading machine with electrical main drive and hydraulic conveyor and elevator. It includes a chip conveyor manufactured by Prab. It was installed in 1978.

E. Grinding Shop: The steel shed annex contains the following electric machinery: 1. a Norton Grinding machine, 2. a Norton Turrent Grinder, 3. an Emory Wheel Grinder, 4. an Acme beveled grinder, and a De Sanno Grinder, all of which date to the 1940s.

F. Chip & Oil Recovery Unit: Built by an unknown manufacturer, this unit includes a centrifugal separator, a chain conveyor, chip bins, and an oil storage tank for separating the oil from the steel chips produced by the threading operations.

G. Magnaflux Inspection Unit: Not on-line, this is a special Q-1899 unit with black light turntable, magnaglo hood, and gravity conveyor. It was installed in 1957.

HISTORY

Built in 1908, the Foundry included facilities to melt and pour iron, brass, babbitt, and tin. It contained two core furnaces and was connected to the plant-wide telpher or coal road system. In 1936 the iron foundry was removed and replaced with the Coupling Blank equipment.

The Coupling Tap Building, built in 1909, was partially rebuilt in 1923, and a steel frame, metal-clad section was added to the west wing. Later, the annexes and interior buildings were added. The original equipment, with the exception of three 5-ton National Tube Company cranes and the National Tube Company Vanishing Machine (Fatigue Tester), was replaced in the 1920s and 1930s. In addition, the coupling finishing line, with the exception of the Vanishing and Face-Recessing Machines and the Chip & Oil Separator, was modernized in 1978 when the electroplating line was installed.

Sources:

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POWER GENERATION AND TRANSMISSION - STEAM

Prior to 1950 National had a decentralized steam generation system in which six boiler plants, located in different sectors of the plant, provided 120-150 psig steam for facilities within their sector. Above-ground remains of this system include the partially dismantled Boiler Houses "A" and "L". Since these buildings have been stripped of steam generation equipment and converted to other uses, they are described in other sections of the inventory. (Electrical Generation System for Boiler House "L", Blast Furnace Plant for "A".) However, historical information on the removed equipment is included in the history section of this report.

From 1950 to 1983 National had a centralized steam generation system in which a single boiler house supplied 850 psig, 750 F. steam for the turboblowers and 150 psig, 450 F. steam for plant-wide use. This steam generation system consisted of the Central Boiler House with five boilers, a Cochran hot process, Water Softening Plant for treating boiler feed water, a Coal Hoist for delivering coal from barges, a 500,000 gallon No. 6 Fuel Oil Tank and Pumping system for storing and delivering fuel oil, and a Walker Thickener and Oliver Filter House for treating sludge from the now demolished blast furnace gas washers and precipitators. With the exception of the Walker Thickener and Oliver Filter House, which have been partially dismantled, the system is intact.

In 1983 the Central Boiler House was shut down, and three small capacity, horizontal "package" boilers were installed at three different locations to power the reduced operations. Shut down along with the plant in 1987, two of the boilers have been removed. Only the one at the Main Pipe Mill remains.

Historic Name: U.S. Steel Corporation, National Tube Works, Central Boiler House
Present Name: USX Corporation, National-Duquesne Works, Central Boiler House
Location: 65' south of the Monongahela River, 720' east of the Main Pipe Mill, National Plant, McKeesport, Allegheny County, PA
Construction: 1950
Documentation: Photographs of the Central Boiler House can be found in HAER No. PA-380-D

DESCRIPTION

The Central Boiler House contains five 175,000 lbs. per hr.

at 850 psig, 750 F boilers and auxiliary equipment. Although the flat roof has a large fissure on the south side beside the stack, the building and equipment are in good condition. The coke oven gas line has recently been removed from the building. The friable asbestos has also been removed and is contained in plastic bags on the first floor.

I. <u>Central Boiler House Building</u>: Erected by the American Bridge Company, the steel frame structure is 187' x 127'. It is 87' high to the top of the parapet wall. A 166' x 26' monitor extends 9' above the top of the parapet. The structure is supported on a foundation of concrete-filled pipe piles. The exterior wall is constructed of insulated Galbestos, a composite material made of asbestos, fused onto asphalt and galvanized steel. The windows and doors are metal. Principal floors of the building are concrete with some areas of grating. The roof consists of composition roofing over insulated steel decking. The exterior of the building is finished with aluminum paint. The building is divided into seven levels, with levels two through seven linked by a 3,500 lb. capacity elevator manufactured by the Otis Elevator Company. A covered bridge connects the building with the Water Softening Plant to the south. Ventilation for the building is maintained by the suction effect of the forced draft fans and ten Wolverine Axivent roof-mounted exhaust fans.

II. <u>Steam Generating Equipment</u>: The system for producing steam consists of five boilers with water-cooled furnaces each equipped with a tubular air heater, tangential burners, a Raymond bowl type coal pulverizer and feeder, superheater, spray type desuperheater and other related equipment.

A. <u>Boilers</u>: The five Combustion Engineering & Superheating, Inc. boilers are of the two drum type, water tube design with a maximum continuous steam generating capacity of 175,000 lbs. per hour at the desuperheater outlet at a pressure of 850 psig and a temperature of 750 F. Each has a heating surface of 13,800 square feet and a total of 672 tubes.

B. <u>Superheaters</u>: Each boiler has an Elesco, welded joint, pendant-type superheater with sixty-three steel tubes. Of the convection type, the superheaters utilize hot gases to raise the saturation temperature of the steam (550 F) from 200 degrees to 750 F.

C. <u>Desuperheaters</u>: Each boiler is equipped with a desuperheator which automatically maintains the temperature of the output steam at 750 F by water spray.

D. <u>Furnaces</u>: Each boiler includes a refractory brick-lined furnace with 3" diameter water tubes located on the bottom, roof and all sides for cooling.

E. Air Preheaters: Each furnace is equipped with an air preheater which preheats combustion air with spent flue gases. The air heaters have a total heating surface of 16,500 square feet, are of the tubular two-section counterflow type, and designed for gas flow through the tubes in a vertical downward direction.

F. Coal Pulverizing Equipment: Each boiler has a coal crushing mill consisting of a C. E. Raymond bowl; a pulverizer powered by an enclosed, 150 hp, 2,300 volt AC motor; and a cast iron feeder powered by a GE, 1 hp motor. Heated combustion air is supplied by a 3" steel pipe, and the mixture of air and pulverized coal is transferred to the coal burner through an 8" diameter steel pipe.

G. Fuels and Burner Equipment: Each boiler is fitted with four tangential (i.e., located on the furnace corners) burners mounted in wind boxes and arranged for horizontal firing. Each burner has three sections with its own air regulating apparatus. The top and bottom sections of each burner are fitted to burn gases, while the middle section is piped to burn coal. A pilot burner is installed in each corner of each boiler using coke oven gas to maintain constant ignition in the boilers. The boilers were originally equipped to burn blast furnace gas and pulverized coal. Original specifications call for coal that is slack to 1 1/4" in size. The capacity of the boilers is limited to 175,000 lbs. per hr. of steam when burning pulverized coal alone. Originally, coke oven gas was used exclusively for ignition burners, but in 1973 the tangential burners were altered to permit its use as a fuel. In 1977 a Cowan oil gun was installed on burner No. 2 on each of the boilers and the fuel supply system was modified to permit burning of No. 6 fuel oil.

III. Draft System: The system for supplying combustion air, ejecting flue gases, and segregating ash from the boilers consists of one forced draft fan and one induced draft fan for each boiler. A combustion control system monitors and regulates the overall performance of the system.

A. Forced Draft Fans: There is one forced draft fan per boiler, the purpose of which is to supply combustion air to the furnace. These are double inlet, variable speed units with 38" diameter wheels operating at a normal shaft rpm of 1,150. They were manufactured by the American Blower Corporation. The fans are powered by Westinghouse Electric Corporation one-stage steam turbines which normally operate at 830 psig steam and a nominal speed of 1,180 rpm. They exhaust steam at 25 psig.

B. Induced Draft Fans: For ejecting flue gases, there is one induced draft fan per furnace. These are double inlet, variable speed units with inlet damper control, each having a capacity of 505,000 lbs. per hour of flue gas at 655 F and operating at a normal speed of 1,180 rpm. They were manufactured by the Buffalo Forge Company. The fans were driven by Westinghouse Electric Corporation one-stage steam turbines which normally operate at 830 psig and a nominal speed of 1,180 rpm. They exhaust steam at 25 psig.

C. Combustion Control Equipment: Manufactured by Hagan Corporation, the pneumatic-powered system monitors and regulates the speed of the drivers of the forced and induced draft fans, the inlet dampers of the forced and induced draft fans, the pulverizer coal feeders and the butterfly valves in the blast furnace gas supply line. A master pressure controller common to all boilers transmits an impulse to pressure controllers installed on each boiler gage board to proportion the load carried by individual boilers. This system was augmented in 1977 with the installation of devices to control temperature and pressure of No. 6 fuel oil. Operator display panels are located on the third level of the building.

D. Instrument Air Compressors: Two one-stage air compressors manufactured by Chicago Pneumatic Tool Company with 12" bore and 11" stroke, were installed in the first floor to provide instrument air. One of the compressors was driven by a 75 hp, Westinghouse electric motor; the second by a GE steam turbine operating at 150 psig.

IV. Boiler Feed Water System: This system consists of two parallel, but interconnected systems, so arranged in order that any one unit may be taken out of service without disruption to operations. The boiler feed water system, located in both the Central Boiler Plant and the adjacent Water Softening Plant, supplied water to the water softening plant, heated and deaerated it after softening, then fed it to the boilers. Water was supplied to the water softening plant and preheated by the following equipment: three treated water pumps, two blowdown heat exchangers, two low pressure closed feed water heaters and drip pumps (for pumping condensate). Equipment for heating, deaerating and supplying softened water to the boilers consists of three softened water pumps, two direct contact deaerating heaters, four boiler feed pumps, two high pressure closed heaters and drip pumps (for pumping condensate).

A. Feed Water: Ninety-five percent was clarified Monongahela River water after passing through hot process lime-soda softeners and filters, the remaining 5 percent is condensate.

B. Three Treated Water Pumps: These are centrifugal units manufactured by Allis-Chalmers. Two are driven by 60 cycle electric motors, the third by a steam turbine operating at 150 psi. These pumps deliver water, treated with lime at the River Pump House, from the service water system, and push it through a 1/8" Hellan strainer to the heat exchangers.

C. Two Blowdown Heat Exchangers: These two units are low pressure closed type heat exchangers. They are the shell and tube design with 682, 10'-4" straight, arsenical copper tubes and floating heads. They were manufactured by the Griscom-Russell Company. The heat exchangers take heat from the blowdown water from the boilers, stored in the two continuous blowdown flash tanks, and transfers it to the cold, filtered service water, thus raising its temperature from 50 F to 71 F.

D. Two Low Pressure, Closed Feed Water Heaters: Manufactured by the Griscom-Russell Company, these are of the horizontal straight tube type, complete with hot well. The heaters are fitted with 30 percent - 70 percent cuprous nickel alloy tubes, steel tube sheets, and floating heads. Each is equipped with a condensate storage tank. Steam at approximately 150 psia was employed as a heating agent. The heaters raised the temperature of the water emanating from the blowdown heat exchangers from 71 F to 350 F prior to its delivery to the water softeners. The condensate from the spent steam used in these heaters was delivered to the desuperheaters by two drip pumps. Manufactured by the Wilson-Snyder Manufacturing Division of the Oil Well Supply Company, the four-stage pumps are rated at 290 gpm. One of the drip pumps was driven by a 100 hp motor, the second by steam turbine. Each pump was designed to handle the drips from both heaters, the motor-driven pump to be in service with the turbine driven pump as a stand-by.

(From this point the preheated water is treated in the Water Softening Plant, described below, before it is passed to No. 5.)

E. Three Softened Water Pumps: These centrifugal pumps were manufactured by Allis-Chalmers. They operated at a nominally constant speed of 1,750 rpm and have a capacity of 1,375 gpm. Two of the pumps are motor-driven by 30 hp motors. The other pump is steam turbine driven and operates at 150 psig; it exhausts steam at 5 psig. The pumps took heated, softened water from the softeners and pump it to the deaeraters.

F. Two Deaerating Feed Water Heaters: These units were manufactured by Cochrane Steam Specialty Company. They operated at a constant pressure of 25 psig. Each was designed for an output of 600,000 lb per hour of water at 263 F. They are of the thoroughfare type and equipped with a full set of stainless steel trays to reduce oxygen content of the water to .005 cc per liter. Each heater has a separate tank to store heated and deaerated water. The deaeraters receive steam at 335 F from the Blowdown Flask Tanks, heat the feed water to a temperature of 263 F, in the process removing gases and noncondensable vapors in the softened water. The spent steam from the deaerators, including the dissolved oxygen, is transmitted to the Water Softener reaction tanks. This arrangement, discussed below, was the source of a continual corrosion problem at the softeners.

G. Four Boiler Feed Pumps: These centrifugal pumps were manufactured by the Ingersoll-Rand Company. Three are turbine-driven and one is motor-driven. Each pump was capable of handling 430,000 lb per hour of feed water at a dynamic head of 992 psig. The turbine drives, manufactured by Terry Steam Company, are designed to receive steam at 839 psig, and to exhaust it at 150 psig. The motor for the single pump is a 800 hp, 2,300 volt, unit manufactured by Allis-Chalmers. The pumps pushed boiler feed water from the deaerating feed water heaters through the high pressure closed heaters to the boiler drums.

H. Two High Pressure, Closed Feed Water Heaters: Manufactured by the Griscom-Russell Company, the heaters are the tube and shell type, fitted with 30 percent - 70 percent cuprous nickel tubes. They are placed horizontal and have straight tubes with floating heads (i.e. they expand with temperature changes). They are equipped with condensate storage tanks. Heat was supplied by steam at 173 psia. Their function was to heat the boiler feed water pumped from the boiler feed pumps from 263 F to 350 F. The condensate from these heaters was delivered to the desuperheaters by two drip pumps manufactured by Wilson-Snyder Manufacturing. The six stage pumps had a capacity of 267 gpm. Each pump was designed to handle the drips from both heaters, the motor driven pump to be in service with the turbine driven pump as a stand-by. One pump was driven by a 200 hp, 2,300 volt, General Electric motor; the other by a General Electric Company steam turbine operating at 150 psig and exhausting at 25 psig.

V. Ash Handling Equipment: This Allen-Sherman-Hoff Company ash system is of the pneumatic type and includes equipment for the removal of furnace bottom ash, dust and fly ash, as well as a vacuum cleaning apparatus and an ash storage silo.

A. Furnace Ash Hoppers: Each of the five boilers has a hopper located at their bottoms fitted with an 8" transport line with air inlet valves for ash removal.

B. Fly Ash Separators: Two Aerotec Corporation centrifugal-type fly ash collectors per boiler were installed between the gas outlet of the air preheater for each boiler and its induced draft fan inlet. Each separator is fitted with tubes and a hopper for the collection of ash. The equipment was capable of handling 300,000 lbs. per hour of flue gases per hour at 600 F.

C. Vacuum Cleaning Apparatus: A vacuum of 10" to 16" of mercury, created in a collector tank by means of the condensation of 155 psi steam exhausted from a steam jet, was used to clean ash from plant surfaces.

D. Ash Storage Silo: Located directly east and adjacent to the Central Boiler House, this is a 16' diameter x 31' high, vitrified tile silo with a capacity of 100 tons. It is equipped with a dustless unloader.

Historic Name: U.S. Steel Corporation, National Tube Works, Water Softening Plant
Present Name: USX Corporation, National-Duquesne Works, Water Softening Plant
Location: 180' south of the Monongahela River, and 800' east of the Main Pipe Mill
Construction: 1950
Documentation: There are no photographs of the Water Softening Plant

DESCRIPTION

The Water Softening Plant is a Cochrane Corporation hot process softening plant that treated, clarified, and preheated Monongahela river water, and reduced its hardness to 12 ppm (parts per million) or less and silica to 1 to 2 ppm. Equipment consists of three 27' diameter, hot process lime-soda reaction tanks, fourteen 11' diameter pressure type anthracite filters, wet-type feeding equipment for lime-soda, a proportioning acid feed system, and accessories. The equipment was designed to continuously delivery 160,000 gallons of softened and filtered water per hour to the boiler feedwater system.

At the time of their construction, the reaction tanks were the largest in the nation.

I. Building: Of the same general construction as the Central Boiler House, the Water Softening Building measures 187' x 47'. It is divided into two components:

A. The western part is one story, approximately 88' x 47' and 16' high, and contains equipment associated with the anthracite filtering tanks located outdoors at ground level.

B. The eastern part, known as the Chemical Building, is two stories, 100' x 47' and approximately 40' high to the level of the roof (the reaction tanks and service tower project rise to a height of 73') and contains the softening and chemical mix tanks and pumps.

II. Hot Process Softeners: No. 1, No. 2 & No. 3 lime-soda reaction tanks are octagonal shaped, with an inside diameter of 27', and a height of 34'. The tanks are supported by steel framework and project up through the second floor and roof. They were manufactured by Cochrane Corporation. No. 1 tank, the spare, is equipped as a second-stage phosphate softening unit and used normally for storage of lime-soda softened water. Within the two normally operable tanks are 1,500 spray jets which sprayed the preheated water from the top of the tank. Steam, transferred from the Blowdown Flash Tanks at the Central Boiler Plant, was injected along the top of the tank from a 24" diameter steam line and mixed with the water. A slurry of hydrated lime, soda ash and hydrated dolomitic lime or magnesium oxide was injected into the tank through a 16" line connection at a point where the steam and water mix. A reaction occurred in which the calcium and magnesium ions in the water are replaced by sodium ions, thereby softening the water. The reaction produces a precipitate or sludge which is collected in the bottom of the reaction tank. The clarified and treated water is then filtered in the anthracite filters.

III. Chemical Feed Equipment: The Chemical Building contains steel tanks, pumps and motors for mixing and feeding lime-soda ash, magnesium oxide, sulfuric acid, sodium sulfite, and sodium metaphosphate into the boiler feed water and boilers.

A. Lime-Soda Mixing Tanks: Three 12' diameter, 6' high, 4,250 gallon capacity lime-soda mixing tanks equipped with agitators and three Ingersoll-Rand 160 gpm lime-slurry pumps driven by 3 hp, Westinghouse motors are used in mixing and feeding a slurry of lime and soda ash and magnesium oxide into the heated water in the reaction tanks.

B. High Acid Mixing Tanks: One 1' diameter and 2' high acid mixing tank and one 4' diameter and 2'-6" high acid feed tank with a capacity of 140 gallons with 2 Milton Roy acid pumps driven by 1/3 hp electric motors are used in mixing and feeding sulfuric acid into the softened and filtered water. The acid was added after filtering to neutralize the overly-basic softened water.

C. Sodium Sulfite Feed Tanks: Two sodium sulfite feed tanks with 3' diameters, 9'-8" high, with a capacity of 150 gallons, two sulfite recirculating pumps manufactured by Worthington Pump and Machinery Corporation with a capacity of 20 gpm and driven by General Electric 1/3 hp electric motors, and two sulfite feed pumps manufactured by Milton Roy with a 6.5 gpm driven by GE 1/4 hp electric motors were used for mixing and feeding sodium sulfite into the softened water at the outlet of the deaerator. Sodium sulfite was injected to scavenge traces of oxygen from the boiler water and thereby prevent corrosion of the boiler metal.

D. Phosphate Feed Tanks: Two phosphate feed tanks, 5'-9" tall and 10' in diameter, with a capacity of 3,000 gallons; five phosphate recirculating centrifugal pumps with a capacity of 500 gpm; and 6 Milton Roy, 50 gpm feed pumps driven by 3 hp motors were used for mixing sodium metaphosphate solutions and feeding them to the drums of the boilers. The phosphate feed pumps, complete with timer controls, are located in the boiler room at the base of the boiler they serve. Phosphates were added to react with any residual hardness in the feed water to form a light sludge which was removed from the boilers by blowing-down.

IV. Anthracite Filters: Located outdoors west of the chemical building at ground level, the fourteen pressure-type anthracite filters have a diameter of 11" and a height of 5'. They are arranged in two groups of seven with an enclosed, one-story valve-operating aisle between them. Following lime-soda and magnesium oxide softening in the reaction tanks, the clarified and treated water was filtered. About once each operating day the filters were cleaned by backwashing. The two centrifugal Allis-Chambers backwash pumps were driven by 25 hp motors.

Historic Name: U.S. Steel Corporation, National Tube Works, Coal Hoist
Present Name: USX Corporation, National-Duquesne Works, Coal Hoist
Location: Along the Monongahela River, 680' east of the Main Pipe Mill, and adjacent to the Central Boiler House
Construction: 1905
Documentation: There are no Photographs of the Coal Hoist

DESCRIPTION

At 134' the Coal Hoist is the tallest structure in the plant. Unused since the early 1970s, its barge unloading boom has been removed, and it is in poor condition.

I. Structure: The steel frame structure measures 50' x 32'. It was designed by the Brown Hoist Machinery Company of Cleveland, Ohio. It is a steel frame structure, covered with steel plate in some areas, with concrete piers. It has four main levels. The first level is on grade and extends upward 39'-7". Three standard-gauge railroad lines extend underneath the hoist at grade level and in an east-west direction. Two 100-ton steel plate bins are mounted above, tied to the girders supporting the second floor. The second level extends 43' upward to an elevation of 82'-7". Mounted on this level are two narrow-gauge tracks, which extend southward, for the plant-wide, elevated coal road. Two 150-ton bins are located above the tracks. The third level extends 39'-6" above the second to an elevation of 122'-1". At this level the coal unloading booms and two Williams Coal Crushers and screens, now removed, were mounted. The operator's cab is located on the extreme northern side on this level. On the fourth level, extending upward 12' to an elevation of 134', is the Motor House, a steel frame building with a corrugated sheet-steel gable roof and siding. This level once contained the two hoist motors.

II. Coal Truck Unloading Facilities: A concrete ramp with steel "grizzly" or screen bars covering a bin in the basement of the Central Boiler House and two Williams Coal Crushers, relocated from the third level of the Coal Hoist, are located in the Central Boiler House basement for the unloading of coal by truck.

III. Dravo Coal Handling Equipment: Located on the north side of the Central Boiler House beside the Coal Hoist are facilities to move coal from the bunkers at the Coal Hoist to the Central Boiler House. The system has a capacity of 150 tons per hour (tph).

A. Seven Rotary Van Feeders: The screw-type feeders are situated at the bottom of the Coal Hoist hopper bin. Each is driven by 2 hp AC motors. They move the coal to the belt conveyor.

B. Belt Conveyor: The rubber conveyor belt is 82'-8" long and 2' wide, with a magnetic pulley. The belt is powered by a 5 hp AC motor, and moves the coal on a horizontal plane to the bucket conveyor located at the northeast side of the Central Boiler House building on the 5th level.

C. Bucket Elevator: A 68'-8" chain belt fitted with 1'-8" wide buckets was powered by a 20 hp AC motor to move the coal vertically from the 5th to the 7th, or top, level of the Central Boiler House.

D. Tripper Belt Conveyor: The rubber tripper belt is 154'-8" long and 2' wide, and was driven at the head pulley by a 7 1/2 AC motor. The belt distributed coal to the five station bunkers.

E. Railroad Coal Feeding Equipment: A spur railroad line is located next to the river from which point railroad cars could dump their load onto barges. Plans made in 1949 for the installation of direct-feed railroad unloading facilities were never actualized. This equipment was not typically used.

Historic Name:	U.S. Steel Corporation, National Tube Works, Walker Thickener and Oliver Filter House
Present Name:	USX Corporation, National-Duquesne Works, Walker Thickener and Oliver Filter House
Location:	The Walker Thickener is 90' south of the Monongahela River, and 1090' east of Main Pipe Mill; the Oliver Filter House is 70' south of the Monongahela River, and 900' east of Main Pipe Mill
Construction:	1950
Documentation:	There are no photographs of the Thickener or Filter House

DESCRIPTION

The Walker Thickener and the Oliver Filter House, along with some blast furnace gas piping, were part of the blast furnace gas cleaning and transmission system. The system was designed to clean and deliver 250,000 cfm of gas so that the maximum residuals in the gas leaving the precipitators was no more than 0.01 grains per cubic foot. Installed in 1950 in conjunction with the construction of the Central Boiler House, original equipment also included two Freyn primary gas washers (wet type) and two Koppers electrostatic precipitators. These were demolished in 1984.

I. Walker Thickener: Located directly east of the boiler plant, this single compartment type thickener has a capacity of 8,000 gpm. The concrete basin is 90' in diameter and 17' deep at the center and 10'-5" deep at the circumference. It is 5' above grade level. The rotating elements, consisting of support assembly, raker arms, and scarifiers, are set on a roller bearing assembly mounted on the concrete pier. They are chain-driven and powered by a 10 hp, AC motor. The stationary elements include the basin, a bridge with decking and railing, influent well, sludge removal piping and launderer troughs. A 12' x 16' brick building, located adjacent to the basin, contains a batch tank for adding chemicals to the sludge water. A pump room, located under the middle of the basin and flooded at the time of the inventory, presumably contains the sludge pumps. The thickener took sludge water from the gas washers and the electrostatic precipitators. At the influent well, the dirty water was treated with polymers to promote the fluxuation or agglomeration of the sludge particles. Inside the basin, which is sloped to the middle, the sludge precipitated and was moved to the middle of the basin by the raking arms. The sludge was collected at the bottom of the basin and pumped to the Oliver filter house, where it was further treated. The clarified water was collected at the top of the basin all along the circumference at the launder troughs. It was then carried in the sewer to the river.

II. Oliver Filter House: Directly east of the boiler house is a filter house built of the same materials as the boiler house except that it does not have pile foundations. This building is approximately 32' x 27' on the east side and 23' on the west side and 50' high, with a penthouse 17' long x 10' wide by 8' high on top. It has two floors. On the second floor is a 11' diameter by 12' Oliver continuous filter with a filtering area of 430 square feet. It consists of a welded steel tank covered with No. 61 cotton twill, a concentric agitator with 1-1/2 hp motor, pipe, and drum drive with 2 hp motor to drive the worm gear and shaft. Also on the second floor is a centrifugal-type Oliver filtrate discharge pump with 3 hp motor. On the first floor of the building is a Worthington air compressor driven by multiple belts by a Westinghouse induction motor, type CS. The Oliver Filter House took sludge from the thickener containing 35 to 40 percent solids, and forced it through the filter with the vacuum pump. This created a filter-cake with a moisture content of 25 percent. The cake was reused in the sintering plant (demolished in 1984), while the filtered water was returned to the thickener.

III. Blast Furnace Gas Piping: Erected by the American Bridge Company, the 108" diameter steel pipe is fitted with both Brassert (plate type) and Goggle valves, and steel expansion joints. It extends from a point approximately 260' southeast of the boiler plant where the Koppers precipitators once stood to the boiler house. Connected to this line is the approximately 120' tall bleeder stack. Before it enters the boiler house, the pipe divides into two 68" lines connected to the 68" boiler house loop. There are two 36" branches from this loop to each boiler.

IV. Koppers Precipitator Control House: Located adjacent to the thickener is a one-story, 24' x 16' concrete block building with three Koppers electrical control panels and a silicon transformer. This is the only remnant of the Koppers blast furnace gas cleaning facilities.

Historic Name: U.S. Steel Corporation, National Tube Works, No. 6 Fuel Oil Tank and Pumphouse
Present Name: USX Corporation, National-Duquesne Works, No. 6 Fuel Oil Tank and Pumphouse
Location: Approximately 360' south of Monongahela River, 1100' east of Main Pipe Mill, National Plant, McKeesport, PA
Construction: 1977
Documentation: There are no photographs of the Fuel Oil Tank and Pumphouse

DESCRIPTION

The No. 6 Fuel Oil delivery system was installed in 1977 to aid the plant in meeting EPA pollution standards. It is in fair condition.

I. Storage Tank: This is a 51'-6" diameter, 32'-3" high steel tank with a capacity of 200,000 gallons. It has electric tank heaters and is surrounded by a concrete dike.

II. Pumphouse: This is a concrete block building 20' x 40' which contains the main circulating pumps: four screw-type Roper pumps to handle 64 gpm of oil per pump, three driven by 25 hp motors and the fourth by a 20 hp, 150 psig steam turbine. Two pumps, probably for unloading fuel oil from trucks, have been removed.

III. Piping: The pipe transporting the oil to the Central Boiler House is 4" in diameter, and is fitted with two line heaters capable of raising the temperature of the fuel oil to 250 F.

HISTORY

The geographic arrangement of steam generation facilities and auxiliaries at the National plant has followed a pattern of decentralization prior to 1950, centralization and integration between 1950 and 1983, and disintegration until the works shut-down in 1987.

I. Boiler Plants:

Prior to the construction of the Central Boiler House in 1950, there were six smaller capacity boiler plants located throughout the plant. Boiler Houses "A" and "B" were built in 1901 by the Monongahela Furnace Division of the National Tube Company. Boiler House "A", the skeleton of the building is still extant (see Blast Furnace Plant), was located directly south of the Blast Furnace Blowing Room, while "B" was located directly east of it. Boiler House "A" measured 210' x 90' and contained twenty-four boilers: fourteen were 500 hp, 150 lbs. pressure Cahall boilers made by Aultman & Taylor, six were 500 hp, 150 lbs. pressure Babcock & Wilcox boilers, and four were 520 hp, 165 lbs. pressure Cahall boilers made by the Stirling Consolidated Boiler Company. Boiler House "B" measured 210' x 50' and had a total of nine boilers, eight of which were 500 hp, 165 lbs. pressure Cahall Boilers made by Aultman & Taylor Machine Company, and one a 520 hp, 165 lbs pressure Cahall Boiler made by the Stirling Consolidated Boiler Company. Boiler Houses "A" and "B" produced steam at 850 lbs. for use in the blast furnace turboblowers. Both burned blast furnace gas. They were abandoned in 1952. The boilers in "A" Boiler House were removed and the building used for storage, while "B" Boiler House was demolished.

Boiler House "F" was a stoker coal-fired facility located between the 13" and 16" Skelp Mill Buildings. It was built in 1906. It was a steel frame building 485' x 45', and 32' high to the roof chord with two lean-to extensions. It had twenty-four small boilers. It produced steam at 150 lbs. mainly for the Skelp Mills. It was dismantled in 1953.

Boiler House "L" was located directly east of the Power House. It was built in 1920. It was a stoker coal-fired facility with two 1,471 hp, double deck, horizontal water-tube Babcock & Wilcox boilers. "L" Boiler House furnished steam for the 10,000 kw Curtis turbo-alternator located in the adjacent Power House. It was shut down in December, 1950 and partially demolished in 1955. A part of the building was preserved to house the steam lines and waste water lines associated with the 10,000 KW turbo-alternator.

"T," or "Temporary," Boiler House was built during World War II to supplement the plant's steam generation capacity. It was located directly east of the 42" Mill Furnace Building near the Center Street Gate. It had three boilers, each rated at 100 lbs steam. It was abandoned soon after the Korean War.

Boiler House "J" was located just west of the McKeesport-Duquesne Highway Bridge, north of the old Skull Cracker and Scrap House Building. It had two 150 hp Babcock & Wilcox boilers producing steam at 120 psi to drive two steam hammers at the Scrap House. It was demolished in 1930.

In addition to these six plants, there were waste heat recovery boilers at the Open Hearth facility capable of generating 35,000 lbs of steam, and individual steam heating engines at the Coupling Tap Building, the Carpenter Shop (extant), and the Foundry.

With the construction of the Central Boiler House in 1950, steam generating facilities were centralized. The entire plant was tied together with asbestos-lined steam piping, and with the exception of the turbo-blowers (operating at 850 lbs), the entire plant received 150 lbs. of steam.

The only major operational change in the Central Boiler House between 1950 and 1983 was a change in fuels. Facilities were installed for burning coke oven gas in 1973, and No. 6 Fuel Oil in 1977. The major problem with fuels was in getting good coal, because suppliers often delivered a dirty product.

There was only one complete shutdown of the plant when feed water was lost to the boilers in 1968. It took 2 1/2 hours to correct the problem. The only major accident was in 1961 when a forced draft fan and steam turbine tore apart. Although a plant engineer was nearby, there were no injuries. Boiler #4 was shut down temporarily.

In 1983 the Central Boiler Plant was shut down. With reduced production needs, the plant returned to a decentralized steam generation system. Three small capacity, horizontal boilers were installed to supply the Main Pipe Mill, the Coupling Tap Building, and the Machine Shop. Only the one at the Main Pipe Mill remains.

II. <u>Boiler Feed Water Plants</u>:

Prior to the construction of the Water Softening Plant in 1950, secondary water treatment was handled at the Skelp Mill Water Treating Plant, a cold process facility built in 1906 located between the 13" and 16" Skelp Mills. It was a 488' x 50', one-story, steel-frame, common-bond brick structure with Pratt roof trusswork and slate roof covering. It was divided into a Pump House, a Soda House, and Purifying Tanks. The Pump House, devoid of equipment, is still standing. (See No. 2 Quench & Temper). The plant used a process involving the addition of dolomitic lime and magnesium silicate to river water in the Purifying Tanks. This caused the scale-causing precipitate to settle. The water was then decanted and pumped with an electric pump and float pipe to the point of use.

Prior to 1950, this plant was utilized as the final boiler feed-water treating facility, working in conjunction with the primary water facility, the River Pump House. Between 1950 and the early 1970s it was a secondary water treatment facility, receiving screened river water from the River Pumphouse, treating and decanting it, then pumping it to the Water Softening Plant. It was abandoned in the early 1970s.

The Water Softening Plant, constructed in 1950 in conjunction with the Central Boiler House, had a persistent corrosion problem. According to Phillip Krepps, National engineer, it was the "stupidest engineering *faux pas* ever." The cause of the problem was the steam which was used to heat the water in the reaction tanks. It emanated from the deaerating heaters in the Central Boiler Plant. It contained dissolved oxygen, carbon dioxide, and other entrained gases which had been scrubbed from the softened feed water in order to prevent corrosion in the boilers. In effect, the corrosion-causing agents had been moved from the boiler plant to the water softening plant. The result was that the steam ate-up the valves, piping and reaction tanks causing numerous leaks and necessitating frequent repairs. The problem was discovered in 1950, and experts from Dravo, Cochran and Calgon examined it. The engineer from Cochran blamed the corrosion on stray currents from the electric grid. For awhile, sodium sulfite was pumped into the tanks to neutralize the oxygen, but this course was abandoned because it required too much of the chemical to be economical. Instead, they simply let the system corrode, replacing parts when they failed.

III. Coal Hoist:

The Coal Hoist was built in 1905. According to a May 25, 1911 Iron Age article, "the coal for the plant is lifted from the river by a coal hoist capable of lifting, crushing, and screening 2,000 tons of coal in 10 hours, this coal being distributed overhead in larries pulled by small electric locomotives." According to a 1925 National Tube Company drawing, the hoist had a capacity of 200 tons per hour. Its steel boom, mounted onto the main frame and supported by steel cables, extended 72' beyond the northern or river side of the structure in a diagonal position over the river. A 70 cubic feet capacity (about 7 1/2 tons) bucket was mounted on the boom. The bucket was lowered into the coal barge and hoisted up, then moved to a position directly above a coal trough, and then dumped, all by means of steel cables and pulleys driven by two 300 hp, 230 volt Crocker-Wheeler motors. Below the trough on the third level were two Williams Patent No. 4 Crushers which crushed the coal before it descended into the two bins. From the bins, the coal was fed onto larrie cars, of which there were two sizes: a 72 cubic feet for the Skelp Mills and a 66 cubic feet for the Tube & Pipe Mills. The larrie cars were pulled on an elevated tramway (elevation 43' above grade at this point) by electric locomotives and delivered to the mills.

With the abandonment of the Skelp Mills and their heating furnaces in 1937, and the completion of the Central Boiler House in 1950, the operations of the coal hoist were tied exclusively to the coal delivery system.

Despite the modernization of all related facilities in the 1950s, the barge unloading area was never mechanized. From the earliest to the last days, the barges were moved by means of hand-powered wenches.

In the late-1970s, the coal hoist was abandoned and partially dismantled. After this time, coal was obtained solely by truck. The steel boom of the Coal Hoist was removed and scrapped.

Sources:

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POWER GENERATION AND TRANSMISSION - ELECTRIC GENERATION

National generated approximately 60 percent of its own power, the remainder coming in from the Duquesne Light Company grid. Its two installations, the Power House, with a 10,000 kw Curtis turbo-generator, and the Low Pressure Power Station, a cogeneration facility with a 3,000 kw Curtis turbo-generator, produced 25 cycle power, while all 60 cycle power came in on the grid.

The Power House is intact and is currently used by the Camp Hill Corporation to distribute 60 cycle power to its pipe-making operations. The Low Pressure Power Station, based on a design developed by the noted French engineer, Professor Auguste C. E. Rateau, was dismantled in 1980 and the turbo-generator removed. However, an intact Southwark Barometric Condenser, three dismantled American steam regenerators, and the Low Pressure Power Station Building remain.

Historic Name:	U.S. Steel Corporation, National Tube Works, Power House
Present Name:	USX Corporation, National-Duquesne Works, Power House
Location:	200' south of the Monongahela River, and 210' east of the Main Pipe Mill
Construction:	1906
Documentation:	There are no photographs of the Power House

DESCRIPTION

I. Building: The Power House building measures 388' x 84'. It is composed of three sections: the original (1906) central section, consisting of a Central Turbine bay and the Electric Repair shop; a remnant of "L" Boiler House (1920); and the 25 & 60 Cycle Switch House (c. 1950). The original section is a steel frame structure with buff-colored, common-bond brick curtain walls. It has a monitor roof with Fink trusswork, and is covered with corrugated sheet-metal. The remnant of the "L" Boiler House, attached to the east side, is of steel frame construction. The roof has Fink trusswork and is partially covered with corrugated metal. The walls are mostly open to the elements. The 25 & 60 Cycle Switch House is a common-bond red brick structure with gable roof that is positioned atop the eastern portion of the original section of the Power House. The foundation of the Power House is concrete, and the floor is concrete with some areas of masonry tile. The original building has segmental-arched window openings on the north, south and west sides, some of which retain the original windows while others are infilled with concrete.

II. Power House Equipment:

A. A Curtis-General Electric 10,000 kw AC Turbo Generator, installed in 1920, is steam powered and produces a 25 cycle current at 6600 volts. It has a 230 volt DC exciter and a flyball, centrifugal governor. Connected to the generator is a low-level, Crocker Wheeler condenser with 10,900 gpm (gallons per minute) cooling water. The cooling water is drawn from the Monongahela river and is filtered through two Hellan strainers. The water is delivered by a De Laval pump driven by a 250 hp, DC, synchronous, 6600 volt motor.

B. Two identical Ingersoll-Rand Two Stage Air Compressors were installed in the 1950s for the plant-wide air system. They are powered by a 250 hp, 6600 volt motor. The stroke is 24". The bore of the low pressure cylinder is 24", while that of the high pressure cylinder is 33". The two are rated at 600 hp each and put-out air into the plant-wide system at 125 psi and 3,850 feet per minute.

C. Two Chicago Pneumatic Two Stage Air Compressors, installed in the 1950s, are steam-powered and produce plant air at 125 psi and at 3,000 feet per minute. They are rated at 700 hp, have a stroke of 30" and have low pressure cylinders of a diameter of 18" and high pressure ones of 24".

D. Electric Repair Shop equipment consists of a turret lathe manufactured by the Hendy Machine Co., a turret lathe manufactured by The Boyle and Emmes Company, an unnamed turret lathe, a drill press, a Milwaukee No. 3 plane lathe, a 35" lathe, a vertical boring mill, and an expanding hydraulic press, all of which appear to date from the 1930s and 1940s.

E. Electrical control equipment, including buses, circuit breakers, switch cells and monitoring equipment for both the 25 and 60 Cycle power systems, is located in the 25 & 60 Cycle Switch House on the second floor of the building.

III. Southwark Barometric Condenser: Adjacent to the Power House building on the east side, this 76' tall tank and piping is made of black metal plates riveted together. It is a counter-current, high-level type condenser manufactured in 1906 by the Southwark Foundry & Machine Company. It includes an electric vacuum pump, used to start the vacuum and eliminate noncondensables. (The original Weiss slide valve air vacuum pump was removed in the 1950s.) Service water, an average of 4,320,000 gallons of water per day, is used as the condensing agent. The two Chicago Pneumatic Air Compressors exhaust into this unit.

IV. 25 Cycle Substation: Located adjacent to the Electric Repair Shop on the north side is the H-Z System, 25-cycle, 44 KV outdoor substation.

V. 60 Cycle Substation: Approximately 40' west of the Power House building is the C-N System, 60 cycle, 69 KV outdoor substation. This was installed in 1962, when the Electric Resistance Weld facilities were put-in.

Historic Name: U.S. Steel Corporation, National Tube Works, Low Pressure Power Station
Present Name: USX Corporation, National-Duquesne Works, Low Pressure Power Station
Location: 200' south of the Monongahela River, 920' west of the McKeesport-Duquesne Highway Bridge, adjacent to the Blooming Mill
Construction: 1910
Documentation: There are no photographs of the Low Pressure Power Station

DESCRIPTION

I. Building: The partially dismantled one-story building measures 62' x 36'. It is a stucco-clad brick structure with the date "1910" embossed on the north wall. The gable roof is covered with metal sheeting.

II. Equipment:

A. An intact Southwark Barometric Condenser, installed in 1910 and identical to the one associated with the Power House (see #3 above) is located north of the building.

B. Three dismantled American (Rateau-type) steam regenerator pressure tanks constructed of riveted steel plates are located north of the building. They measure 43' long x 9'-6" in diameter.

HISTORY

Built in 1906, the Power House was designed to provide electricity for plant-wide use by converting the excess steam produced in the plant's boiler houses into DC electrical energy. Original equipment in the Power House consisted of four 1000 hp vertical cross-compound 22" & 44" x 42", 95 rpm, steam engines, and two Allis-Chalmers, 1700 hp, four cylinder, blast furnace gas engines. The four steam engines were each direct connected to 625 kw direct current, 240-260 volt Crocker-Wheeler DC generators. The two blast furnace gas engines were direct connected to 1200 kw, DC Crocker-Wheeler generators. The four steam engines exhausted to the extant Southwark Barometric Condenser. The total rated capacity was 4500 kw.

In 1910, to supplement the plant's electrical generation capacity, the Low Pressure Power Station was built. It used only exhaust steam from the two non-condensing engines at the slabbing mill and the blooming mill, and from one converting (Bessemer) mill blowing engine. Exhaust steam emanating from the three engines was conveyed to three steam regenerators or accumulators, where it was stored, to a 3000 kw Curtis turbo-generator. The turbine exhaust steam passed to a Southwark barometric condenser designed to furnish 26" of vacuum. Also part of this facility were three 1000 kw synchronous motor generator sets. The current produced was three-phase, 25 cycle AC, 6600 volt.

An article appearing in The Iron Age on May 26, 1910 described this facility as a "unique" and "important low pressure installation." It was based on the design of Professor Auguste C. E. Rateau, the innovative French steam engineer who in 1902 put the first installation of this type into service at Mine de Bruay. The National Tube Company also installed low pressure power stations at its Lorain and Kewanee plants. The McKeesport facility was showcased in a paper, "Operating Experiences with Steam Regenerators," by Frank E. Leahy, Assistant Steam and Hydraulic Engineer at the National Works, in the Proceedings of the Engineers Society of Western Pennsylvania for February 1914. It proved to be a success, operating without major difficulty until being dismantled in the late 1970s.

In 1919, the two blast furnace gas engines and their generators in the Power House were removed and replaced by a Curtis 10,000 kw AC turbo-generator, which remains. This turbo-generator was driven by 250 pounds of superheated steam from "L" Boiler House, built in 1920 solely to serve the turbo-generator. Two of the original vertical cross-compound steam engines and their generators were removed in 1950. In their place, the two Chicago Pneumatic steam-powered two stage air compressors were installed. In 1952 the remaining two steam engines were removed and replaced by the two Ingersoll-Rand compressors. The two Ingersoll-Rand compressors were dismantled in December of 1989 and one of them, along with the cylinders of the second, was moved to the Camp Hill Corporation's facilities nearby for service in the electric resistance weld pipemaking operations.

Since 1988 the Power House has been used by the Camp Hill Corporation. Electrical power from the Duquesne Light grid passes through the 60 Cycle Substation to the 25 and 60 Cycle Switch House, where it is monitored, and then to the electric resistance weld pipemaking operations.

<u>Sources</u>:

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POWER GENERATION AND TRANSMISSION-PRIMARY WATER TREATMENT SYSTEM

In addition to McKeesport city water, which was used primarily for human consumption and sanitation, National utilized great quantities of service water--treated Monongahela river water--for blast furnace and rolling mill cooling, gas cleaning, boiler feed water, and other purposes. The plant had a pumping and primary treating capacity of 150 million gallons per day.

All service water was subjected to primary treatment, consisting of screening and the addition of lime, at the River Pump House. From this point, it was pumped by suction pumps located at the Blast Furnace Blowing Room to the Standpipe, or in some cases, directly to the point of use. From the Standpipe, where it was held at a constant 37 psi, it was transported to the point of use or, in the case of boiler feed water, further purified at the Water Softening Plant.

The entire primary water treatment system is intact. The Standpipe and the water pumps are described in the Blast Furnace Blowing Engine Room report.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, River Pump House and Lime House
<u>Present Name</u>: USX Corporation, National-Duquesne Works, River Pump House and Lime House
<u>Location</u>: Adjacent to the Monongahela River, 1700' east of Main Pipe Mill
<u>Construction</u>: 1921
<u>Documentation</u>: There are no photographs of the River Pump House and Lime House.

DESCRIPTION

The River Pump House is a buff-colored, common-bond brick building that measures 86' x 16'. It is divided into three parts: a central section with two stories and a basement, and two, one-story wings on either side. The central section is divided into five bays, each outlined with corbelled brick work. The center bay is highlighted with a pediment at roof level upon which the date "1921" is embossed. The half-hip roof, covered with metal sheeting, slopes downward to the north or river side.

In the basement of the central section is a basin for receiving water upon which a metal rolling screen, used to filter the incoming river water of large objects, is attached. Formerly the pumps, now located at the Blast Furnace Blowing Room, were situated here.

Connected to the building on the west side are two annexes. The first is the Lime House, a 42' x 16' steel shed building with roof removed. Farther west is a 12' x 12' concrete block building marked "Explosive Storage."

HISTORY

Prior to the construction of the River Pump House in 1921, the Skelp Mill Water Treating Plant, a cold process facility built in 1906 and located between the 13" and 16" mills, served as the only water treatment facility at National. (See Central Boiler Plant, History, Boiler Feed Water Plants, for a description.) After 1921 the River Pump House was used to screen and pump water to the Skelp Mill Water Treating Plant, from which point it was put into service. The addition of the Water Softening Plant in 1950 added an additional purifying process for boiler feed water, but did not change the operation of the River Pump House. In the early 1970s, however, when the Skelp Mill Water Treating Plant was abandoned, the operation of the River Pump House was changed so that lime was added to the water, in effect serving as a primary treating plant. Also at this time, the pumps located in the basement were moved to the Blast Furnace Blowing Room.

<u>Source</u>:

Krepps, Phillip, Turn Foreman and Assistant Superintendent of Shops and Utilities at the National Works, 1950-1982. Interview with author, November 29, 1989.

AUXILIARY BUILDINGS AND SHOPS

There are a total of twelve shops at the National Plant: the Riggers' Building and Valve House, the Roundhouse, the Roll Shop, the Blacksmith Shop, the Yardmaster's House, the Oil House, the Labor Department Shop, the General Machine and Pattern Shop, the Carpenter Shop, the Boiler Shop, the Metallurgical and Physical Lab, and the Mobile Equipment Repair Shop. Of these, the Blacksmith Shop retains most of its original historic character.

Historic Name:	U.S. Steel Corporation, National Tube Works, Carpenters' and Riggers' Building and Valve House
Present Name:	USX Corporation, National-Duquesne Works, Riggers' Building and Meter House
Location:	175' south of the Monongahela River, and 1600' east of the Main Pipe Mill, just east of the Roundhouse
Construction:	c. 1906 for Meter House, 1927 for Riggers' Building
Documentation:	Photographs of the Riggers' Building and Meter House can be found in HAER No. PA-380-E.

DESCRIPTION

The Riggers' Building and the Meter House are two separate buildings, asymmetrical in layout and shape, that have been joined on the second floor. The brick buildings are in fair condition.

The Meter House is a two-story, common-bond, red brick building that measures 30' x 30'. It has a brick foundation and small, square window openings. The gable roof is covered with metal sheeting capped with tar. It is connected to the Riggers' Building by a second story walkway.

The Meter House was locked and could not be entered. Its name and proximity to the main natural gas line suggests that it is probably a natural gas metering station.

The Riggers' Building is a two-story, common-bond, red brick building that measures 22' x 57'. It has a brick foundation and small rectangular window openings. The gable roof is covered with sheet metal and is capped with tar in places. There is a small, recent addition on the south side that is one-half the width of the main building with an unusual, half-gable roof.

The interior of the Rigger's Building is divided into a shop, locker rooms, and offices for the blast furnace riggers. It is also a storage area for wire cables, hooks, and small winches.

HISTORY

A 1911 plan depicts the Meter House and labels it "Valve House." This suggests two things: 1. This building was constructed prior to that date, probably in 1905-06 when the nearby Roundhouse and other brick buildings were built; and 2. its original, as well as later, use was probably to monitor the flow of natural gas to the plant.

The Riggers' Building, constructed in 1927, was first known as the Carpenters' and Riggers' Building. It was laid-out in an oblique angle to the Meter House because it had to be fit between the Roundhouse and the roadway. The south addition, unusual in its shape because it also had to be carefully positioned, was probably added in the 1950s or 1960s. The walkway between the two structures appears to date from either of these two decades as well.

Historic Name:	U.S. Steel Corporation, National Tube Works, McKeesport Connecting Railroad Roundhouse
Present Name:	USX Corporation, National-Duquesne Works, McKeesport Connecting Railroad Roundhouse
Location:	100' south of the Monongahela River, and 1400' east of Main Pipe Mill
Construction:	1906
Documentation:	Photographs of the Roundhouse can be found in HAER No. PA-380-E.

DESCRIPTION

Facilities for the repair and service of McKeesport Connecting Railroad locomotives and stock, as well as offices for personnel, were located at the Roundhouse. The building has had the equipment removed, but it is in generally good condition and retains a high percentage of its original structure.

I. Roundhouse: The building measures in gross terms 220' x 180'. It is divided into two sections, the Roundhouse and the Car Repair Shop. It is a steel frame structure with buff-colored, common-bond brick curtain walls. The numerals, "1906" are embossed on the south wall. It is two stories, with a clerestory above the craneway. The majority of the segmented-arch windows retain the original sash; the remainder have been in-filled with concrete block or green fiberglass. The roof is supported by riveted, Pratt truss and covered with metal sheeting sealed with tar. The foundation and floors are concrete. A central marshalling yard, in the middle of which is a sand tower, is located south of, and is partially encircled by, the building.

II. Equipment and Interior Layout:

A. Roundhouse: The interior is divided into nine bays. Three have retained their original layout and function, and have standard gauge railroad lines leading through wood doors to the central yard outside. The others have been remodeled and the track removed. The interior is nearly empty: a) an Acme turret lathe and b) a Cincinnati Shaper with a 24" Crank, dating to the 1930s or later, are located in Bay 9.

B. Car Repair Shop: The shop interior is divided into two bays: a main, repair bay with Pratt roof trusswork, and a smaller tool bay with a lean-to roof and half-Warren metal trusswork. The repair bay is equipped with a 25-ton Whiting Company crane. The roof sheathing is wood. It looks original and contributes significantly to the shop's historic appearance. Most of the arched window openings retain what appears to be their original sashes, while the others have been in-filled with cinder block. Two standard gauge railroad lines extend into the shop and are positioned above lighted pits where below-grade repairs are made. The shop presently contains no machinery. A brick annex has been added on the east side of the shop.

HISTORY

The Roundhouse was built in 1906 to serve the McKeesport Connecting Railroad, the in-plant railroad company. The company had originated as an independent concern, but was taken-over by the National Tube Company by 1901. A 1920 map shows that the company had 6.05 miles of track at the National Plant and 22.66 acres of land devoted to rails, yards, and facilities. The railroad transported raw, semi-finished, and finished materials between plant departments. It had connections with three outside lines, including the Pennsylvania Railroad, the Pittsburgh and Lake Erie Railroad, and the Baltimore and Ohio Railroad. These outside lines also had yards within the boundaries of the National Plant. They moved raw materials and finished products from the yard to points outside of plant's boundaries. By the 1970s, 70 percent of all the National Plant's products were shipped by rail.

Modifications in the Roundhouse, including the construction of the brick annex on the east side and the interior cinder block buildings, were made in about 1950. The original turntable, located in the central yard, was removed and replaced by the sand tower.

The facilities were abandoned in 1987 when the plant was closed. Presently, the McKeesport Connecting Railroad maintains an office trailer on property leased from USX by Camp Hill Corporation. It provides in-plant shipping for Camp Hill's ERW pipemaking mill.

Historic Name:	U.S. Steel Corporation, National Tube Works, Roll Shop
Present Name:	USX Corporation, National-Duquesne Works, Roll Shop
Location:	700' south of the Monongahela River, and 460' east of the Main Pipe Mill
Construction:	1905
Documentation:	Photographs of the Roll Shop can be found in HAER No. PA-380-E.

DESCRIPTION

Facilities for turning and dressing rolls, as well as the company's Payroll Offices, are located in the Roll Shop. The brick building, which has an embossed date of "1905" on the east facade, contains machinery dating from 1901 to 1962.

I. Roll Shop Building:

The two-story building measures 360' x 80' and has a full basement. The Roll Shop is divided into a main north bay and a lean-to on the south, where the Payroll Offices are located on the second floor. It is a steel frame building with buff-colored common-bond brick walls. It has concrete foundations and floors. The roof is supported by Pratt trusswork with riveted connections, and it is covered with corrugated metal. There are large window openings in the walls, many of which have been covered with translucent fiberglass. The building supports a craneway upon which rest two 20-ton EOT cranes, manufactured by Niles and installed in 1906. The Roll Shop Yard and Runway, with a 20-ton Youngstown crane installed in 1906, is located on the north side of building.

II. Roll Shop Equipment: Approximately 60 percent of the floor space in the main bay is used for the roll storage racks. The roll turning and dressing equipment is in the remaining space. It consists of the following electric lathes and grinders:

A. 40" x 19' Bed Roll Lathe manufactured by MacKintosh-Hemphill, installed in 1962.
B. 50" x 14' Bed Roll Lathe manufactured by United, installed in 1958.

C. 22" x 16' Bed Roll Lathe by Garrison, installed in 1906.
D. 34' x 26' bed Roll Lathe by Garrison, installed in 1901.
E. 60" x 12' Bed Roll Lathe by the Pittsburgh Machine & Tool Company, installed in 1908.
F. 18" x 16' Bed Roll Lathe manufactured by Garrison, installed in 1906.
G. 36" x 18" Bed Engine Lathe manufactured by Niles, installed in 1938.
H. 34" x 20' Totten-Hogg Bed Roll Lathe, dating to 1901.
I. 32" x 12' Standard Engineering Bed Roll Lathe, installed in 1928;
J. 14" Twin Wheel Grinder by Hammond, installed in 1952;
K. 14" Twin Wheel Grinder by Blount, installed in 1933;
L. 20" Emery Wheel Grinder manufactured by Springfield, installed in 1906;
M. 32" Emery Wheel Grinder by Springfield, installed in 1906;
N. Dual Wheel 10" Heavy Duty Bench Grinder by Thor, installation date unknown;
O. 12" Floor Mount Belt Sander by Wallis, installation date unknown.

HISTORY

Built in 1905, the Roll Shop has undergone few changes over the years. With the exception of the modification of the windows and the addition the Payroll Offices and some machinery, it remains much the way it was in 1905.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, Blacksmith Shop
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Blacksmith Shop
<u>Location</u>: 675' south of the Monongahela River, and 300' east of the Main Pipe Mill
<u>Construction</u>: 1906
<u>Documentation</u>: Photographs of the Blacksmith Shop can be found in HAER No. PA-380-E.

DESCRIPTION

I. <u>Blacksmith Shop Building</u>: The building measures 150' x 70' and is 30' from the floor to the bottom chord of the truss. It is divided into three bays: a main, central bay is 150' x 40'; two side-bays or lean-tos on the north and south sides of the building are each 150' x 15'. It is a steel frame building with common-bond brick curtain walls. There is a clerestory with glazed windows on the north and south sides; those on the south have been in-filled with fiberglass. The west facade end of the building has a vehicular bay door made of wood and two windows; on the east end the bay door has been in-filled with concrete blocks. The central bay has a riveted, Pratt truss, while the two side-bays have half-Howe trusses. The roof covering is recent, corrugated galvanized metal sheeting. There is a 10-ton EOT crane in the main bay. It is unlike any other in the plant, both in the manner in which current is transmitted to the motors and in the location of the operators' cabs. The electrical current is carried on 12 metal strips mounted along the entire length of the north wall. The two cabs are mounted on the shop floor.

II. Blacksmith Shop Equipment:

A. Numerous hand tools, including furnace tongs and two anvils, are located throughout the facility.
B. Four steam hammers manufactured by Niles-Bement presses were installed in 1906.
C. Two small (3' high, 2' diameter) batch furnaces are natural gas-fired.
D. The forging furnace is 10' x 8' with a single burner. It is natural gas-fired. It appears to be the original equipment, but both the combustion air and induced draft air fans are recent additions.

HISTORY

Built in 1906, the Blacksmith Shop first served only the lower division of the plant--the blast furnaces, steel-making facilities and primary rolling mills. A section of the present Boiler Shop was the blacksmith shop for the upper works. In the 1930s the upper works blacksmith shop was abandoned.

The major change in the building since its erection was the installation of galvanized roof and wall covering, probably in the 1950s.

Historic Name: U.S. Steel Corporation, National Tube Works, Oil House
Present Name: USX Corporation, National-Duquesne Works, Oil House
Location: 625' south of the Monongahela River, and 50' east of the Main Pipe Mill
Construction: 1906
Documentation: There are no photographs of the Oil House.

DESCRIPTION

I. Oil House Building: The one-story building is 39'-8" x 83'-8", and has a basement. It is 15'-8" from the floor to the bottom chord of the truss. The common-bond brick walls are buff-colored brick on the outside, red brick on the inside. The building is set upon a concrete foundation and has concrete floors. It has a gable roof with Fink trusswork, covered with corrugated sheet-metal. There are four round ventilators on the roof ridge. The building has four double sash, 9 x 9 windows with rectangular window openings on the north side; the other sides lack fenestration. The west gable end is embossed with raised brickwork spelling the word, "OIL." A metal sign on the west side reads, "Electronic Shop." Mounted on a craneway spanning the building is a 1/2-ton crane.

II. Oil House Equipment: On the south wall of the first floor is a 6' high x 4' diameter oil tank with a capacity of 1000 gallons, constructed of heavy metal sheeting riveted together. Its appearance and construction suggests that it is an older type. Next to the tank is an oil pump driven by a Westinghouse AC, 10 hp motor. Also on the south wall is another pump, manufactured by Boston and driven by a Reliance Duty-Master AC, 10 hp motor which is associated with the oil tanks in the basement. A control panel for the pumps reads, "spray oil pump" & "threading oil pump." Along the north wall are nine old-looking hand oil pumps, connected to two oil storage tanks in the basement. A small office is located in the northeast corner on the first floor.

HISTORY

The Oil House was built in 1906. Drawings indicate that the first floor of the building had small offices in the northeast and northwest corners. Original equipment included ten 7500 and 1500 gallon oil tanks positioned in the basement, a 1000 gallon mixing tank, several smaller mixing tanks and nine hand pumps, all located on the first floor. Of this original equipment, two large tanks in the basement, the 1000 gallon mixing tank, and the nine hand pumps remain. The roof was waterproofed in 1933, but since construction there have been no major changes in the building.

Historic Name: U.S. Steel Corporation, National Tube Company, Labor Department Shop
Present Name: USX Corporation, National-Duquesne Works, Labor Department Shop
Location: 650' south of the Monongahela River, and 350' east

of the Main Pipe Mill, south of the Spare Parts Storage Building (formerly the 42" mill)
Construction: 1910
Documentation: Photographs of the Labor Department Building can be found in HAER No. PA-389-E

DESCRIPTION

The two story, common-bond, red brick building is 60' x 40'. It has a concrete foundation and floors and a concrete gable roof clad with corrugated sheet-metal.

The interior is divided into offices and a storage area. The storage area contains plant drawings and labor records for the period between 1977 and 1984.

HISTORY

Built in 1910, the Labor Department Shop was a station for pipe mill labor, the riggers and shippers. With the exception of the repair of the roof in 1931, the building exterior remains unchanged. The interior, however, appears to date from the 1960s.

Historic Name: U. S. Steel Corporation, National Tube Works, Scale Repair House
Present Name: USX Corporation, National-Duquesne Works, Yardmaster's House
Location: 687' south of Monongahela River, 110' east of Main Pipe Mill
Construction: 1908
Documentation: There are no photographs of the Yardmaster's House.

DESCRIPTION

The Yardmaster's House, situated at the entrance to the Skelp Storage Yard, was used to monitor McKeesport Connecting Railroad activity in the yard. The equipment has been removed, but the building is in generally good condition and retains much of its original structure.

This is a one story, buff-colored, common-bond brick building that measures 39'-3" x 28'-9". It has a brick foundation. The northeast corner wall is braced with a metal plate. The windows, some of which have been in-filled, are openings with keystones and borderstones. The gable roof is covered with sheet-metal and is fitted with a single ventilator.

<u>Historic Name</u>: U.S. Steel Corporation, National Tube Works, General Machine Shop, Pattern Shop and Storage Building
<u>Present Name</u>: USX Corporation National-Duquesne Works, National Plant: Same
<u>Location</u>: 1100' south of Monongahela River, 200' north of Lysle Boulevard, 260' west of Main Office
<u>Construction</u>: 1906
<u>Documentation</u>: Photographs of the Machine Shop, Pattern Shop and Storage Building can be found in HAER No. PA-380-E.

DESCRIPTION

Much of the machinery in the Machine Shop was sold at the auction held at the National Plant on April 17, 1990. The inventory was conducted prior to this date.

I. <u>Building</u>: The building is 408' x 77'-8". It is divided on a traverse plane into two sections, a 238' x 77' Machine Shop and a 170' x 77'-8" Pattern Shop, which are connected on the first floor. The building is also divided on a longitudinal plane into two parts, a 408' x 53' main aisle on the south, and a 408' x 24' side aisle on the north. There are also two later additions. Projecting from the east facade is a 37'-5" x 24'-5" one-story, brick Master Mechanics Office building. On the north side, an approximately 36' x 20' one-story, brick addition, located along the east end of the north wall, unites the structure with the Foundry or Coupling Blank building on the north.

The Machine Shop is one story and the Pattern Shop is four stories. The first story is the machine floor, while the upper three stories of the Pattern Shop are devoted to pattern storage.

The building is steel frame with brick-encased columns and common-bond, buff-colored brick walls. The steel columns and brick walls are set on a concrete foundation. The floors are reinforced concrete. There are windows on the first floor of the building. On the south side, below the craneway, there are paired 9 x 9 x 9 windows hung in rectangular openings in each of the bays. The three upper floors of the Pattern Shop have no windows, nor is there direct access to the first floor. Access is provided through an outside elevator carried on a skeleton steel frame fastened to the steel frame of the building. The north, lean-to addition also had windows of a similar type, but most have been blocked. There is a clerestory on the south side above the craneway in which pairs of 3 x 3 double sash windows are hung. The gable ends also have windows of the same type.

The main aisle of the building has a gable roof, while the side aisle has a lean-to roof. The roof is covered with corrugated sheet-metal. The main aisle has a 15-ton crane in the main building; the side aisle a 5-ton crane.

II. Equipment: Located in the main aisle of the first floor of the building is the following equipment:

A. Shear with Cincinnati Press Brake
B. Lorry Flat Car
C. 1/2" to 1-1/2" diameter N. C. Drill by W. P. Hill
D. 30" Vertical CutMaster Turrent Lathe manufactured in Bridgeport, Connecticut
E. Horizontal Lathe by American Tool Company
F. King 75" Vertical Boring Machine, installed 1935
G. Yale Diesel Forklift
H. Grinder by Marrison in Rockford, Ill., installed 1958
I. Union Horizontal Boring Machine
J. Portable Sweeping Machine by Wayne,
K. 12" Vertical Shaper mfg. by Pratt-Whitney installed in 1937
L. Niles Slotter and Vertical Shaper with 20" stroke
M. Lathe manufactured by Gishilt
N. Planer manufactured by Bemont Pond and installed 1936; Drill Press added in 1972
O. 54" x 27" Planer manufactured by Sellers of Philadelphia, Pennsylvania, installed in 1938
P. 4A Universal, Hollow, Hexagon Turrent Lathe manufactured by Warner & Swasey Co., Cleveland, Ohio installed in 1939
Q. 3A Turrent Lathe manufactured by Warner & Swasey Co., installed 1943, rebuilt 1965
R. 24" x 24" x 10" Planer manufactured by G. A. Gray Co.
S. 80" Vertical Boring Machine manufactured by King Machine Co., Cincinnati, Ohio, installed in 1936
T. Planer-Miller manufactured by Cleveland Planer Works
U. 5" Boring Mill manufactured by Lucas Machine Tool Company, Cleveland, Ohio, installed in 1949
V. Gear Cutting Machine manufactured by Gold & Everhart, Newark, New Jersey
W. Forcing Press manufactured by Lucas Machine Tool Company, Cleveland, Ohio
X. High Speed Hack Saw by Marvel installed 1945
Y. Two Turrent Lathes manufactured by Acme Machine Company, Cincinnati, Ohio installed in 1937 & 1943
Z. 20" Lathe manufactured by Monarch of Sydney, Ohio installed 1940
Aa. 24" Lathe manufactured by Monarch installed 1937
Bb. Planer manufactured by Rockford in Rockford, Illinois
Cc. Slotter manufactured by Pratt & Whitney

III. Equipment: Located in the lean-to that is attached on north side:

A. Grinder manufactured by Abrasive Machine Tool Company
B. Turrent Lathe manufactured by American Machine Tool Works Cincinnati, Ohio installed in 1943
C. Grinder manufactured by Grinders Inc., Cincinnati, Ohio, installed in 1940
D. Drill Press manufactured by Milwaukee Miller, installed 1940; Mill manufactured by Kemp, Smith
E. Slotter manufactured by Hanson
F. 20" Shaper
G. Lathe manufactured by Hendy
H. Two Grinders manufactured by Norton
I. Grinder manufactured by Ex-cell-o
J. Thread Grinder manufactured by Jones & Lamson.

The second, third, and fourth floors of the Pattern Shop, the Pattern Storage Area, contain various wood patterns which were not inventoried.

HISTORY

The General Machine Shop and Pattern Shop were built in 1906. According to Iron Age, November 6, 1906:

> ...the pattern shop and the pattern storage building, which occupy a portion of the machine shop building, are practically completed and are in use. The pattern storage department occupies three upper floors of a four story portion of the building, which is of steel, with brick curtain walls and reinforced concrete floors. The pattern storage floors have no windows nor other openings whatever inside of the walls, the only access to these floors being by means of an outside elevator carried on a skeleton steel frame fastened to the steel frame of the building.
>
> Each floor is provided with a fireproof door, and the electric light switch is placed in a recess in the brick wall outside the door. A special pipe line for fire purposes only runs along the elevator structure, and at each floor is placed a reel of hose ready for instant use in case of fire. These precautions seem adequate to protect the valuable patterns of the company from damage by fire. The shops will be connected with each other and with the different mills and the electric repair shops by means of an overhead trolley or telpher, which will be able to travel without interference and convey machinery or materials not aggregating more than 4,000 lb. from any department to any other department, necessitating but one operator.

A 1906 drawing shows that the telpher was located in the space between the north wall of the building and the Foundry Shop. Also shown is a track running from the Machine Shop to the Foundry Shop. Both of these lines were dismantled, presumably in the 1950s or 1960s when the brick addition connecting the building to the Coupling Blank Building (Foundry) was built. Another drawing indicates that the Master Mechanics Office was built in 1910. It was originally divided into three rooms, "Mr. Duncan's" office, a bathroom, and a larger room for time keepers, a draftsman, and an "A. H. A. Desk." Later, this became the "Industrial Relations" office. No 1906-era machinery, with the possible exception of the crane, is extant. Much of the machinery in the shops was installed between 1937 and 1943, a period when no major capital improvements were made at the plant.

Historic Name:	U.S. Steel Corporation, National Tube Works, Carpenter Shop and Carpenter Annex
Present Name:	USX Corporation, National-Duquesne Works, Carpenter Shop and Carpenter Annex/No. 1 Substation
Location:	Carpenter Shop is 800' south of the Monongahela River, 120' west of the Main Pipe Mill, and adjacent to the Boiler Shop; the Carpenter Annex is 860' south of the Monongahela River, and 60' west of Main Pipe Mill
Construction:	1908
Documentation:	There are no photographs of the Carpenter Shop.

DESCRIPTION

The Carpenter Shop contains machinery dating from 1906 to 1967, including an intact, 1906 6" (bore) x 9" (stroke), high speed Sturtevant steam heating engine and a 1906 Tenon Machine. The Carpenter Annex was converted into No.1 Substation in 1930; part of it is currently used for carpentry equipment storage.

I. Carpenter Shop Building: The building measures 220' x 62' overall. The walls are common-bond brick and are covered with stucco. There are concrete foundations and floors. The gable roof is supported by Fink trusswork with sheet-metal covering. The building is divided on a traverse plane into two parts, both under one roof: the 104'-6" x 62' Carpenter Shop on the west and the 115'-6" Lumber Storage area on the east. The Lumber Storage area has no walls, rather it is surrounded by a fence made of pipe. It has two storage levels. The Carpenter Shop is 24'-8" high from the floor to the bottom chord of the truss. It is mostly one story, with a mezzanine on the north side. The shop floor, paint shop, tool room and offices are on the first floor;

the mezzanine is the location for the saw sharpening shop and locker room.

II. Carpenter Shop Equipment: The Carpenter Shop contains the following equipment:

A. A Sturtevant steam heating engine, a double-action, one cylinder unit and heating coils are housed in a one-story room attached to the west wall of the Carpenter Shop. They are accessible from the Lumber Storage Area. They were installed in 1906.
B. 26" Electric Rip Saw manufactured by Oliver, installed in 1957;
C. Electric Vertical Borer manufactured by Root, installed in 1955;
D. Electric Tennon Machine manufactured by Fay-Egan, installed in 1906;
E. 24" Electric Wood Turning Lathe manufactured by Oliver, installed in 1916;
F. 24" Electric Table Jointer manufactured by Oliver, installed in 1923;
G. Single Spindle Shaper manufactured by Fay-Egan, installed in 1926;
H. No. 80, 16" Electric Rip Saw manufactured by Oliver, installed in 1926;
I. 16" Electric Radial Arm Saw manufactured by DeWalt, installed in 1956;
J. Two 36" Electric Band Saws manufactured by Tannewitz, installed in 1967;
K. Electric Saw Gumming Machine with wire brush wheel manufactured by Covel, installed by 1924;
L. No. 55 Electric Planner manufactured by Buss, installed in 1958.

III. Carpenter Annex Building: The common-bond brick building measures 70' x 50'. It has a gable roof and is covered with tarred sheet metal. There are three round ventilators on the roof ridge.

There are two 36" Electric Band Saws, manufactured by Tannewitz and built in 1963, and a 16" electric Radial Arm Saw, manufactured by DeWalt and built in 1947, stored inside.

HISTORY

The Carpenter Shop was built in 1908. At first the shop was used to produce and repair various wood structures and tools, the shop also began producing forms when the Pattern Shop shut down in 1967.

Historic Name: U.S. Steel Corporation, National Tube Works, Boiler and Blacksmith Shops
Present Name: USX Corporation, National-Duquesne Works, Boiler Shop
Location: 720' south of the Monongahela River, and 140' west of the Main Pipe Mill, adjacent to the Carpenter Shop.
Construction: 1908
Documentation: There are no photographs of the Boiler Shop.

DESCRIPTION

I. Boiler Shop Building: The building measures 294' x 86' and is 36'-6" from the floor to the bottom chord of the truss. It is a steel frame structure with corrugated sheet-metal roof and walls, with a clerestory in which there are sliding sash windows. It has a concrete foundation and floors. It has a monitor roof with a Fink truss. Originally, the building was two separate structures: the easterly Blacksmith Shop, 154' x 86', and the 140' x 86' Boiler or Structural Shop on the west. There is also a one-story steel shed, approximately 18' x 36', located 15' west of the building. Formerly known as the Electric Crane Repair Shop, it is currently used by Camp Hill Corporation for storage.
II. Boiler Shop Machinery: The Boiler Shop is intact and contains the following machinery:

A. Plasma Arc Plate Cutting Machine manufactured by Linde, installed in 1974;
B. 72" Electric Radial Drilling Machine with 50 hp motor manufactured by American, installed in 1969;
C. 10" Power Hack Saw manufactured by Marvel, installed in 1957;
D. 21" Electric Throat Hole Punch manufactured by Long Allstatter, installed in 1918;
E. Single Spindle Bolt Threading Machine manufactured by Landis, installed in 1969;
F. Universal Slitting Shear Punch & Bar Cutter manufactured by Buffalo, installed in 1967;
G. Electric Sheet Metal Shear with 100" knife manufactured by American, installed in 1941;
H. Pneumatic Riveting Machine manufactured by Hanna, installed in 1918;
I. Hydraulic Riveting Machine manufactured by Wood, installed in 1911;
J. 13' Plate Bender manufactured by Wickes, installed in 1918;
K. Electric 26" Throat Hole Punch manufactured by Long & Allstater, dated 1901;
L. Electric Plate Forming Machine, manufactured by Lown,

installed in 1969;

M. Hand-Powered 10' Sheet Metal Folder and Brake Machine manufactured by Robinson, installed in 1908;

N. 36" x 24' Bed Lathe manufactured by Niles, installed in 1918;

O. 42" x 27' Bed Lathe manufactured by Niles, installed in 1925;

HISTORY

When it was built in 1908, what is currently known as the Boiler Shop was two separate facilities, the Boiler (or Structural) Shop and the Blacksmith Shop. The two were consolidated about 1934.

Historic Name: U.S. Steel Corporation, National Tube Company, Metallurgical Lab
Present Name: USX Corporation, National-Duquesne Works, Metallurgical and Physical Lab
Location: 475' south of the Monongahela River, and 100' west of the Main Pipe Mill
Construction: 1925
Documentation: There are no photographs of the Metallurgical Lab.

DESCRIPTION

The Physical Lab contains facilities for performing tests on steel and finished steel pipe products. It is currently leased from USX by the Camp Hill Corporation, which uses it to test pipe samples.

I. Physical Lab Building: The building measures 190' x 56' overall. It is divided into three sections:

A. The original section, measuring 59' x 45", was built in 1925. It is a one-story, red, common-bond brick structure with a basement. It has rectangular window openings and glazed sash. The gable roof has a wood support system covered with metal shingle strips with ventilators.

B. A two-story addition, added about 1940, is 56' x 26'. It is a red, common-bond, brick structure with segmental-arched window openings. The gable roof has a wood support system.

C. A one-story, steel shed addition, measuring 75' x 26', was built in 1968. It is steel frame structure with steel deck wall and roof covering. It is a lean-to positioned on the south side of the Coupling Tin Plate Building.

II. Physical Lab Equipment:

A. The original section contains: 1. a ring test room with a lathe and ring test bench; 2. a metallographic dark room; 3. a photographers room and dark room; 4. a microscope room; 5. a hardness tester; 6 a pyrometer room; 7. a large test room with a Riehle 150,000# tensile tester, a Baldwin 200,000# tensile tester, and a Brinell machine.

B. The two-story addition contains: 1. a women's sanitary facility; 2. a large testing room with a Kearney and Trecker Milling Machine; 3. a Burke Milling Machine; 4. a 30" Cincinnati Milling Machine; 5. a 20" Gemco Shaper; 6. a Marvel Saw; 7. a Marvel No. 81 Band Saw; and 8. a grinder.

HISTORY

Before 1925 facilities for testing finished steel pipe were in the Physical Lab, located east of the Office Annex, and the Coupling Tap Building. The Metallurgical and Physical Lab was built by the Wood Works of the American Sheet and Tin Plate Company. In 1956 U.S. Steel acquired the site, and began using the testing equipment. In 1968 the steel shed addition was built. In 1988 the Camp Hill Corporation leased the facility from USX Corporation.

Historic Name:	American Sheet and Tin Plate Company, Wood Works, Conditioning and Plate Shearing Department Building; U.S. Steel Corporation, National Tube Works, Coupling Tin Plate Building
Present Name:	USX Corporation, National-Duquesne Works, Mobile Equipment Repair Shop
Location:	425' south of the Monongahela River, and 175' west of the Main Pipe Mill
Construction:	c. 1927
Documentation:	Photographs of these structures can be found in HAER No. PA-380-E.

DESCRIPTION

The Mobile Equipment Repair Shop, formerly a part of the Wood Works, is a steel shed building in which miscellaneous parts are stored.

I. Building: The building measures 160' x 76'-1". It is a steel frame structure covered with corrugated metal sheeting. It is one story with a concrete floor and foundations. There is a large, green, wood door on the east side. The gable roof is supported by Fink trusswork and is covered with corrugated metal.

II. Equipment: There is no equipment inside the building, but mobile equipment is parked on the north side.

A. A 8700 lb. capacity, battery-powered, center-lift Fork Lift manufactured by Elk in 1968.
B. A 5000 lb. capacity, LP gas-powered Fork Lift manufactured by Cat and installed in 1977.
C. A 5000 lb. capacity, propane-powered Fork Lift manufactured by Yale and installed in 1978.
D. A 5000 lb. capacity, center-lift, LP gas-powered Fork Lift of unknown make was installed in 1973.
E. Also in this location are two additional Fork Lifts of unknown make and installation dates.

HISTORY

The Mobile Equipment Repair Shop was originally part of the Wood Works of the American Sheet and Tin Plating Company. A 1927 drawing indicates that it was the Conditioning and Plate Shearing Department Building containing an 144" Plate Shear with a 200 hp motor, and a Caster Table.

After the National Tube Division acquired the property in 1956, the building was converted to a Coupling Tin Plating facility. In 1978, when the Hanson-Van Winkle-Munning Coupling Electroplating line was installed in the Coupling Tap Building, the building was converted to the Mobile Equipment Repair Shop.

Sources:
Milko, Bob, McKeesport Connection Railroad. Interview by author, August 9, 1989.

National Rolling Mills. "General Arrangement of Plant." Drawing #3526. March 22, 1906.

National Rolling Mills. "General Arrangement of Plant." Drawing #3526. March 22, 1906.

National Rolling Mills. "General Description of Physical Condition of National Works." November, 1938.

National Tube Company. "Blacksmith & Boiler Shop, Side Elevations." Drawing #11160. April 17, 1908.

National Tube Company. "Blast Furnaces, Blooming & Skelp Mills, Air Lines General Plan." Drawing #33460. June 9, 1939.

National Tube Company. "Blast Furnaces and Steel Works, General Plan of Steam Piping and Exhaust Lines." Drawing #3399. February 8, 1911.

National Tube Company. "Boiler Shop, General Arrangement of Tools." Drawing #11943. September 19, 1912.

National Tube Company. "Carpenter Shop, General Arrangement," Drawing #11723. June 26, 1911.

National Tube Company. "Foundry & Machine Shop, Details and General Arrangement of Sewers." Drawing #11223. June 12, 1908.

National Tube Company. "Master Mechanics Office, General Arrangement." Drawing #1259. June 28, 1910.

National Tube Company. "Oil Storage House." Drawing #1191. November 18, 1905.

National Tube Company. "Outline Drawing of Buildings." Drawing #2868. December 22, 1909.

National Tube Division. "Metallurgical Department, Arrangement of Equipment." Drawing #T-114799. May 16, 1957.

"The National Tube Company's McKeesport Extensions." Iron Age (November 8, 1906): 1244-45.

United States Steel Corporation, National Works. "Physical Lab, One story Extension, General Arrangement." Drawing #T-121082. June 17, 1968.

United States Steel Company, Wood Works. "MetallurgicalLaboratory Building, Arrangement." Drawing #59-5725. April 28, 1925.

United States Steel Company. "Wood Works, General Plan." January 4, 1927.

USX Corporation, National-Duquesne Works, National Plant. Surplus Equipment Inventory. Unpublished manuscript. c. 1984.

There are a total of ten buildings devoted exclusively to storage at the National Plant: the Brick Storage Building (former 16" Mill Furnace Building), Storage Building (former 13" Furnace Building), Transportation Maintenance Garage, Spare Parts Storage Building (former 42" Mill Building), Brick Shed, Pipe Storage Building (former 110" Mill Building), Stores Building, Appropriation Warehouse, Flux Recovery Building, and the Coupling Storage Building "D". Of these, only the Brick Shed, Stores Building, Appropriation Warehouse, and Flux Recovery Building were designed for storage, the remainder having been converted to this function following changes in plant operations.

The Stores Building is the most notable of the group. For the most part, the original historic fabric of this structure has been retained. With the exception of the Main Office Building and the W. Dewees Wood Building, it is the most ornate of all the buildings on the site.

Also included in this section is a single service building, the Sanitary Building, a remnant of the Wood's Works.

Historic Name:	U.S. Steel Corporation, National Tube Works, 16" Mill Furnace Building
Present Name:	USX Corporation, National-Duquesne Works, Brick Storage Building
Location:	300' south of the Monongahela River, 850' east of the Main Pipe Mill, and 50' east of the 16" Mill Building (#3 Quench & Temper)
Construction:	1906
Documentation:	There are no photographs of the Brick Storage Building.

DESCRIPTION

The building measures 241'-6" x 96' and is 26' from the floor to the bottom chord of the truss. It is divided into two bays of unequal size: the north bay is 241'-6" x 56'-5", the south bay is 241' x 39'-7". It is a steel frame structure with corrugated sheet metal siding that is painted red. The siding appears original. The monitor roof has a Pratt truss covered with corrugated metal sheeting. The floor is concrete and the steel columns rest on concrete piers.

The building is presently arranged for storage. In the north bay are stacks of refractory brick, asbestos insulation, and miscellaneous equipment, including several old wood wagons, some with wood wheels. The south bay is equipped with three rows of metal racks approximately 12' high in which spare parts, many of which are electrical, are stored.

HISTORY

The Brick Storage Building was built in 1906 and served as the 16" Mill Furnace Building until 1936. It was constructed from the same design as the 13" Mill Furnace Building. Originally, it had a penthouse extending upward to a height of 46' that housed an elevated tramway for the delivery of coal to bunkers above the heating furnaces. This structure was removed, presumably when the heating furnaces were dismantled, and presently only the knee braces for the tramway, mounted onto the steel columns, remain.

The original equipment for the building included four box-type, heating furnaces. The furnaces had electrically-powered, mechanical stokers driven by one lineshaft extending along the entire length of the building. Draft for the furnaces was supplied by four No. 10 B. F. Sturtevant blowers. The furnaces were loaded by a hydraulic slab pusher which ran along rails the entire length of the building, and four 1-1/2-ton loading cranes. The heating furnaces took steel blooms in sizes ranging from 4" x 6" to 4" x 14'-1/2", heated them to a working temperature, and delivered them via an electrically-driven roller table to the 16" Skelp Mill.

<u>Historic Name</u>: U.S. Steel Corporation, National Works, 13" Mill Furnace Building
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Storage Building
<u>Location</u>: 475' south of the Monongahela River, 810' east of the Main Pipe Mill, and 40' east of the 13" Skelp Mill (#2 Q & T)
<u>Construction</u>: 1906
<u>Documentation</u>: There are no photographs of the Storage Building.

DESCRIPTION

The building measures 241'-6" x 96' and is 26' from the floor to the bottom chord of the truss. It is divided into two bays of unequal size: the south bay is 241'-6" x 56'-5"; the north bay is 241' x 39'-7". It is a steel frame structure with most of the siding removed. There are areas on the east and west facades that are covered with corrugated sheet siding that appears to be a recent addition. The monitor roof has a Pratt truss and is covered with corrugated metal sheeting that appears original. The floor is mostly dirt and gravel with some areas of concrete. The columns are set on concrete pier foundations. There is a 5-ton crane located on a craneway in the north bay.

The building is presently arranged for storage and equipped with six rows of metal racks running east-west. The racks are approximately 12' high and filled with electrical and miscellaneous parts, some of which are old. Shop tools, many of which appear quite old, are stored in an enclosed area on the east end of the building. Near the center of the building is a 20' x 30', 4' high concrete pad where spools of electrical cable are stored.

HISTORY

The Storage Building was constructed in 1906 and served as the 13" Mill Furnace Building until 1936, when the 13" Skelp Mill was shut down. It was constructed from the same design as the adjacent 16" Mill Furnace Building, the only difference being that its penthouse was located on the south, rather than the north, side. According to drawings, the building was originally fully enclosed with corrugated metal siding, and had a penthouse. The penthouse housed an elevated tramway for delivery of crushed coal into bunkers above the heating furnaces from the plant-wide telpher or elevated tramway system. This structure was removed, presumably when the heating furnaces were dismantled, and today only the braces for supporting the tramway, mounted onto the steel columns, remain.

Original equipment for the building included four heating furnaces of the box type. The heating furnaces had electrically-powered, mechanical stokers driven by one lineshaft extending along the entire length of the building. Draft for the furnaces was supplied by four No. 10 B. F. Sturtevant blowers. The furnaces were loaded by a hydraulic slab pusher which ran along rails for the entire length of the building and four 1-1/2-ton loading cranes. The heating furnaces took steel billets in sizes ranging from 4" x 4" to 4" x 7-5/8", heated them to a working temperature, and delivered them via an electrically-driven roller table to the 13" Skelp Mill.

<u>Historic Name</u>: U.S. Steel Corporation, National Works, Riggers' Building
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Transportation Maintenance Garage
<u>Location</u>: 550' south of Monongahela River, 850' east of Main Pipe Mill, 20' east of 13" Skelp Mill (No. 2 Q&T)
<u>Construction</u>: c. 1935
<u>Documentation</u>: Photographs of the Riggers' Building can be found in HAER No. PA-380-E.

DESCRIPTION

The building measures 290' x 50' and is one story. It is a steel frame structure with concrete foundation and floors, and corrugated metal siding. The gable roof is supported by Pratt trusswork and covered with corrugated metal. The building is devoid of equipment.

HISTORY

Sometime between 1935 and 1947 the Riggers' Building, constructed in the 1920s, was enlarged. This later addition became the Transportation Maintenance Garage.

Historic Name: U.S. Steel Corporation, National Tube Works, Brick Storage Building, Ore Sample House, and Lower Division Superintendent's Office
Present Name: USX Corporation, National-Duquesne Works, Brick Shed and Lower Division Maintenance Office
Location: 680' south of the Monongahela River, and 690' east of the Main Pipe Mill
Construction: 1910
Documentation: There are no photographs of these structures.

DESCRIPTION

I. Brick Shed Building: The building measures 210' x 50', and is approximately 30' from the floor to the bottom chord of the truss. It is a steel frame building with brick-encased, steel columns and brick curtain walls. The roof is covered with corrugated metal sheeting. It has concrete foundations and floors. In lieu of louvers or a clerestory, there are openings below the eaves on both the north and south walls.

The building is divided into three rooms: the Ore Sample House, Brick Storage Area and Asbestos Storage Room. The Brick Storage Area contains several stacks of refractory and regular brick, mortar mix, several portable mortar mixers, and a natural-gas fired furnace for curing refractory brick and asbestos components. The Ore Sample House contains an electric ore crusher by Sturtevant, installed in 1930, and two smaller fine ore crushers, also manufactured by Sturtevant, which were installed in 1936. In addition, the sample house also contains mixing vats, Toledo scales and various chemicals.

II. Lower Division Maintenance Office: The building measures 70' x 50'. It is a one-story brick building, with a corrugated metal roof. It is "L" shaped, the south wing being attached to the west wall of the Brick Shed.

Historic Name: U.S. Steel Corporation, National Tube Works, 42"

Mill and Skelp Mills Electric Shop
Present Name: USX Corporation, National-Duquesne Works, Spare Parts Storage, Pipe Shop
Location: 550' south of the Monongahela River, and 250' east of the Main Pipe Mill, adjacent to 13" Skelp Mill (No. 2 Quench & Temper)
Construction: 1906
Documentation: There are no photographs of these structures.

DESCRIPTION

The building measures 520' x 75' and is 33'-6" from the floor to the bottom chord of the truss. The steel frame structure has recent, corrugated metal walls and roof covering. The north wall also serves as a wall for the 13" Skelp Mill Building. It has a clerestory on the south side. The floors and foundations are concrete. The monitor roof is supported by Fink trusswork. The steel frame supports two EOT cranes, one a 20-ton repair crane, the second a 10-ton charging crane. Both were manufactured by the National Tube Company in 1906.

The Pipe Shop, approximately 58' x 48', is a one-story buff-colored, common-bond brick annex. It is attached to the 42" Mill Building on the south side. The Pipe Shop is divided into three interior rooms. It contains various parts and supplies.

HISTORY

The 42" Mill and the Skelp Mills Electric Shop were built in 1906. They were abandoned in 1937. During World War II, the 42" Mill Building was known as the Motor Tube Building. In April, 1945 a 44' x 16' annex, the Rocket Research and Development Plant Supervisor's Office was built adjacent to the 42" Mill on the north side. This annex has since been demolished. In recent years the 42" Mill Building served as a spare parts storage area, while the Skelp Mills Electric Shop was converted to the Pipe Shop.

Historic Name: U.S. Steel Corporation, National Tube Works, 110" Plate Mill
Present Name: USX Corporation, National-Duquesne Works, Pipe Storage
Location: 75' south of the Monongahela River, and 450' east of the Main Pipe Mill
Construction: 1906
Documentation: There are no photographs of the Pipe Storage Building.

DESCRIPTION

The building measures 400' x 82', including a 72' x 24' brick addition on the west end of the south wall which is used as a locker room. The building is one story and measures 34' from the floor to the bottom chord of the truss. It is a steel frame structure with walls on the north and south side composed of buff-colored, common-bond brick up to a level of 4'. Above this, the north and south walls are corrugated metal sheeting. The east and west gable wall coverings are wholly corrugated metal sheeting. The monitor roof is supported by a Fink truss. The roof covering is also corrugated metal sheeting. The steel columns rest on concrete piers. The floors are mainly dirt with limited areas of concrete. The building has windows in a clerestory on the north side which have been fitted with fiberglass. There is one single 15-ton EOT crane. A standard gauge railroad track runs down the length of the building on the north side.

The building is largely empty, serving as a storage area for a few miscellaneous pieces of machinery and a section of dismantled coke oven gas pipe. On the southeastern corner of the building is a 24' x 12' locker room. Next to the locker room is an anvil mounted on a steel plate workbench.

HISTORY

Constructed in 1906, the Pipe Storage Building was originally the 110" Plate Mill. It contained machinery to reduce slabs produced at National's slabbing mill to plates in widths between 25" and 96-1/2". The plate was then used in the plant's butt and lap-weld pipemaking operations.

Originally, there were two other buildings, also constructed in 1906 and now demolished, which were associated with the 110" Plate Mill: the Plate Mill Furnace Building, which was located directly east of the Pipe Mill and was demolished when the Central Boiler House was built in 1950; and the Plate Mill Gas Producer Building, located south of the Furnace Building and demolished in 1950 when the Water Softening Plant was constructed.

With the adoption of seamless operations in 1930, the need for plate for large diameter pipe subsided. The facilities were mothballed in 1937 when the manufacture of all buttweld pipe was discontinued. In 1950 when the Submerged Arc Weld pipemaking operation was put on-line, plate was obtained from Homestead rather than renovating the 110" Plate Mill. It is unclear when the equipment was taken out of the building.

Historic Name: U.S. Steel Corporation, National Tube Works, Store House
Present Name: USX Corporation, National-Duquesne Works, Stores Building
Location: 750' south of the Monongahela river, and 200' west of the Blacksmith Shop
Construction: 1906
Documentation: There are no photographs of the Stores Building.

DESCRIPTION

The building measures 207'-6" x 41'-5" and is 26'-1" from the floor to the bottom chord of the truss. It has two stories with an attic and basement. The walls are buff-colored, common-bond brick. Structural support is provided by steel columns made of 1'-6" diameter steel pipe placed in the center of the building under the first and second story floors. The floors of each level are concrete with steel joists. An elevator connects each level. The steel frame, gable roof is supported by Fink trusswork. The 1-1/8" tongue-and-groove pine sheathing is covered with asbestos shingles.

The building has two types of windows. Dormers with casement windows, six each for the north and south elevations, embellish the roof and provide light for the second floor. Each of the sixteen bays has six windows, with the exception of the single bay on the west end, which has three. The windows are arranged in pairs, so there are two for each level. The windows are 2 x 2 double-hung sash and are set in rectangular openings.

Exterior stairways to the second floor and the basement are located along the north elevation. The west gable end has double doors, which serve as the main entry, and four windows on the first floor and four on the second. The west elevation has a sign posted: "Central store r'm & receiving, 1st floor electronic repairs, 2nd floor industrial engineers." The east elevation has the back door, a larger service door above which a steel boom with two cranes is positioned, and five windows.

The interior of the building is equipped mostly for storage. The basement has shelves along the walls for storage. The first floor is divided so that there are three offices, a receiving area, and a clerk's cage extending for a distance of 60' from the west wall. The interior walls are lathe and plaster. The remaining area is largely devoted to storage with 10' high racks arranged in rows. The elevator is situated near the center of the building. Next to the it is a Toledo scale. The second floor is divided as the first, but the six interior rooms have wood walls and paneling. The open space in the center of the room is cluttered with boxes of supplies; wood cabinets are located along the walls.

HISTORY

The Stores Building was constructed in 1906. Its original function was to receive, store, and distribute light goods and serves as a place to pay employees. A 1906 construction drawing reveals that there have been only minor changes over the years.

The exterior has seen remarkably little modification: stairways to the second floor and to the basement have been added on the north side. Since a major function was to pay employees, the building originally included a 3' x 7' fireproof vault and a special "pay window" on the first floor. These interior facilities, along with a 3' exterior landing located on the south wall, have been removed. The 1906 drawing identifies the first floor offices as such: "Room 1 - Mr. Ayers, Room 2 - Mr. Beattie, Room 3 - Railroad, Room 4 - Receiving, Rooms 5 & 6 - Clerks Pay, Room 7 - Clerks." These offices appear to have changed little. The major structural change in the first floor is that the original stairways to the basement and second floor have been dismantled and new ones built in another location. The second floor office area was originally divided into three rooms. On the drawing the two larger rooms are labeled "Room 8 - Time Keepers, Room 9 - Clerks." The smaller room is unlabeled. These rooms have since been redivided and remodeled; from the appearance this was probably done in the 1960s.

With the exception of the Main Office Building and W. Dewees Wood Building, this is the most ornate of all the buildings on the site. It is the only building with dormer windows. For the most part, the original historic structure has been retained. Also, although employees were no longer paid from it in the latter years and offices were added, the building has retained its original function as a storeroom.

<u>Historic Name</u>: U.S. Steel, American Sheet and Tin Plate Company, Wood Works, Sheet Mill Department and Plate Mill Department Building
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Appropriation Warehouse
<u>Location</u>: 425' south of the Monongahela River, and 360' west of the Main Pipe Mill
<u>Construction</u>: c. 1920
<u>Documentation</u>: There are no photographs of the Appropriation Warehouse.

DESCRIPTION

The one-story building measures 182'-4" x 100'-2" and has a clerestory. It is a steel frame structure covered with corrugated, galvanized metal sheeting. It has a concrete floor and foundations. The monitor roof is supported by Fink trusswork.

HISTORY

The Appropriation Warehouse was once part of the Wood Works of the American Sheet and Tin Plate Company. A 1927 drawing indicates that it was the Sheet Mill Department and Plate Mill Department Building, and that it contained six gas-fired furnaces, a Roll Scouring Mill powered by a 1250 hp motor, a control room, and oil circuit breakers.

After the National Tube Division of U.S. Steel acquired the property in 1956, the building was converted to the Appropriations Warehouse. Later, after the Camp Hill Corporation re-opened the ERW Mill in 1988, it was leased from USX and used to store spare parts.

<u>Historic Name</u>: U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, Storage Building
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Flux Recovery Building
<u>Location</u>: 375' south of the Monongahela River, and 500' west of Main Pipe Mill
<u>Construction</u>: c. 1920
<u>Documentation</u>: There are no photographs of the Flux Recovery Building.

DESCRIPTION

The one-story building measures 34'-4" x 52'-6". It is a steel frame structure with walls and roof clad with corrugated metal sheeting. It has a concrete floor and foundation. The monitor roof is supported by Pratt trusswork.

The building was last used to recover spent flux from the Submerged Arc Weld (SAW) operation at the Main Pipe Mill. A Type D Roto Clone grinder and separator, with rubber conveyor belt, metal bins, and bagging equipment, is contained in the building. In the operation, the spent flux, recovered from the SAW line in a fused state, is pulverized, and the chunky silica is discarded, while the reusable portions are bagged.

HISTORY

A 1927 drawing identifies the building as a "Storage" facility in the Wood Works of the American Sheet and Tin Plate Company. It was converted into a Flux Recovery facility soon after the installation of the SAW line in 1950.

<u>Historic Name</u>:	U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, Box House and the Cold Roll, Inspection and Finishing Department Building
<u>Present Name</u>:	USX Corporation, National-Duquesne Works, Camp Hill Corporation, Coupling Storage Building "D"
<u>Location</u>:	350' south of the Monongahela River, and 600' west of the Main Pipe Mill
<u>Construction</u>:	c. 1920
<u>Documentation</u>:	There are no photographs of Coupling Storage Building "D."

DESCRIPTION

The building measures 442' x 108', and is 34'-3" from the floor to the bottom chord of the truss. It is a steel frame structure with walls and roof clad with corrugated metal sheeting. There is a clerestory fitted with green, translucent fiberglass. It has a concrete foundation and floor.

The building is divided into two sections, the West Main Bay, a 442' x 60' structure with gable roof, and the East Side Bay, a 192' x 48' lean-to.

HISTORY

Coupling Storage Building "D" was a part of the American Sheet and Tin Plate Company's Wood Works until 1956, when the National Tube Division of U.S. Steel purchased it. A 1927 drawing identifies the West Main Bay as the Cold Roll, Finishing, and Inspection Department, containing a two-stand, Cold Roll Mill with a 800 hp motor, a 60' Leveler, a 36" x 192" Roll Grinder, a 60" Shear, a 80" Leveler, and four 1000 lb. capacity Bundling Scales. The East Side Bay is identified as the Box House, containing the Metallurgical and Inspection Office, the Paper Production Machine, 126" Squaring Shears, a Rip Saw, and a Cut-Off Saw.

In 1964, after the ERW Mill was built nearby, U.S. Steel replaced the girts and siding on the east and south side of the building. The building is currently leased from USX by the Camp Hill Corporation, which uses it as a storage facility in support of its ERW pipe-making operations.

<u>Historic Name</u>: U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, Wash and Locker Building
<u>Present Name</u>: USX Corporation, National-Duquesne Works, Sanitary Building
<u>Location</u>: 375' south of the Monongahela River, and 360' west of the Main Pipe Mill
<u>Construction</u>: c. 1920
<u>Documentation</u>: There are no photographs of the Sanitary Building.

DESCRIPTION

Once a part of the Wood Works, the Sanitary Building was last used by both men and women employees in the Coupling Department. It is mostly intact, but in poor condition.

The one-story building has a basement and measures 127' x 28'-6". It is composed of buff-colored, common-bond brick with rectangular window openings on the north and south sides. The building has a concrete foundation and floors. The gable roof is covered with corrugated metal sheeting.

The interior includes lockers, showers and sinks for bathing. It is divided into two sections: one for men and another for women. The furniture and plumbing appear to date to the 1960s.

HISTORY

A 1927 general plan of the Wood Works shows that the "Wash and Locker Building" contained showers, lockers and a "rigger's room." In 1956 when the National Tube Division took over the Wood Works, the facility was taken-over for use by the Coupling Department. The building was renovated in the 1960s, and the roof covering, as well as the interior furniture and plumbing, date to this period.

<u>Sources</u>:
Dunn, Jim, former employee of the Tin Shop at National, and currently the manager of the drawing room for Camp Hill Corporation. Interview with author, March 21, 1990.

National Rolling Mills. "13" and 16" Mill Furnace Buildings, Sections through Bays at East End." Drawing #K 3260.

National Tube Company. "Blast Furnaces, Blooming & Skelp Mills, Air Lines General Plan." Drawing #33460. June 9, 1939.

National Tube Company. "General Arrangement of Plant." Drawing #3526. March 22, 1906.

National Tube Company. "Outline Drawing of Buildings." Drawing #2868. December 22, 1909.

National Tube Company. "Rocket Research and Development Plant, Shop Superintendent's Office." Drawing #3633. April 28, 1945.

National Tube Company. Skelp Mills. Pittsburgh: George H. Alexander & Company, Inc., 1911.

National Tube Company. "Store House Outside Elevation." Drawing #187. August 22, 1906.

National Tube Company. "Store House Plan of Floors." Drawing #188. August 28, 1906.

National Tube Division, United States Steel Corporation. "Request for Authority to Retire Property: 34-1/2" - 26' Bed Roll Grinder [a skelp mill facility]." February 5, 1953.

"The National Tube Company's McKeesport Extensions." Iron Age (November 8, 1905): 1244-5.

United States Steel Company. "Wood Works, General Plan." January 4, 1927.

United States Steel Corporation, National Works. "Coupling Storage Building D, Siding on East & South Side." Drawing #W-8533. March 20, 1964.

United States Steel Corporation, National Works. "Equipment Inventory List." Unpublished manuscript, 1984.

There are six office buildings on site: the Main Office, the Main Office Annex, the Guardhouse, the W. Dewees Wood Building, the former Hospital, and the former Clockhouse. The latter two are remnants of the Wood's Works, which was founded in 1851 and absorbed by the National Tube Division of USS in 1956. (Other remnants of the Wood's Works are the Physical and Metallurgical Lab, the Mobile Equipment Repair Shop, the Appropriation Warehouse, the Flux Recovering Building, the Coupling Storage Building D and the Wash and Locker Room, described in the Storage and Shops section of this report.)

The Main Office Building, built in 1876, is the oldest structure on the site. The W. Dewees Wood Building, built in 1889, is the oldest structure on the Wood Works portion of the site.

Historic Name: U.S. Steel Corporation, National Tube Works, Main Office Building
Present Name: USX Corporation, National-Duquesne Works, Main Office Building
Location: 175' south of the Main Pipe Mill, and 250' east of the Machine Shop
Construction: 1876
Documentation: Photographs of the Main Office Building can be found in HAER No. PA-380-E.

DESCRIPTION

The Main Office Building is the oldest building on the plant site, and a fine example of Victorian architecture. It is in good condition. It is presently being used as an office by the Turner Construction Company and as a Print Room for National and Duquesne drawings.

The Main Office Building measures 96' x 94' overall, and is divided into two sections, a 60' x 59' original section on the west side, and a 36' x 34' addition on the east side. It is a two-story common-bond, red brick building with a stone foundation, and stone window sills and lintels. The rectangular window openings are fitted with 1 x 1 sash. The central entrance features a marble staircase and a skylight on the second story roof. The roof is flat and is covered with tin.

HISTORY

The Main Office was built in 1876, just four years after the National Tube Company was founded. It housed the Administrative, Order and Engineering Offices. The building was enlarged in 1907, and the first floor interior was remodeled in the 1960s, while the second floor appears unchanged.

Historic Name: U.S. Steel Corporation, National Tube Works, Main Office Annex
Present Name: USX Corporation, National-Duquesne Works, Main Office Annex
Location: east of the Main Office Building
Construction: 1880
Documentation: Photographs of the Main Office Annex can be found

in HAER No. PA-380-E.

DESCRIPTION

The Main Office Annex measures 62'-6" x 62'-6". It is a two story common-bond brick structure with an attic and basement. The gable roof is supported by wood trusses covered with tin on wood sheathing.

HISTORY

Built in 1880, the Main Office Annex housed the Main Emergency Hospital, Physical Lab, Safety Department, Metallurgical Department, Chief Inspector's Office and Cost Department. It was remodeled in 1920, 1926 and 1935. The Annex was last used as the Production Planning Office and as a depository for older plant drawings.

Historic Name:	U.S. Steel Corporation, National Tube Works, Locust Street Garage
Present Name:	USX Corporation, National-Duquesne Works, Locust Street Guardhouse
Location:	200' south of the Main Pipe Mill, and 120' west of the Main Office Building
Construction:	1910
Documentation:	Photographs of this structure can be found in HAER No. PA-380-E.

DESCRIPTION

The Guardhouse measures 60' x 50'. It is one story, and measures 16' from the concrete floor to the roof cord. The frame of the building is pipe, the walls and roof are plaster on metal lathe. The gable roof is covered with tin.

HISTORY

Built in 1910 and remodeled in 1935, the structure housed the Superintendent of Police and Welfare, the Garage Foreman, and the Gate Watchman. It also served as the Waiting Room for visitors to the mill. Situated at the Locust Street entrance to the plant, the Guardhouse served as a checkpoint for employees and supplies. It is currently in use.

Historic Name:	U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, W. Dewees Wood Office Building, Employment and Student Training Office

Present Name: USX Corporation, National-Duquesne Works, W. Dewees Wood Office Building
Location: 450' south of the Monongahela River, and 620' west of the Main Pipe Mill
Construction: 1889
Documentation: Photographs of the W. Dewees Wood Office Building can be found in HAER No. PA-380-E.

DESCRIPTION

The W. Dewees Wood Office Building is the oldest building on the Wood Works portion of the site. The interior has been extensively remodeled, but the exterior, with the exception of a one-story extension added in 1947, retains nearly all of its original structural and decorative features. The building is in generally fair condition, but is in need of repair.

The common-bond, red brick building measures 88' x 48' overall. The flat-roofed, one-story 20' x 48' 1947 addition is located on the north side.

The historic part of the building measures 68' x 48', and it is a three story structure with a basement. It is designed in the style of a Victorian townhouse. Originally situated on the corner of Walnut St. and Second Avenue, the building is oriented so that it fronts toward both the west (Walnut) and north (Second) with the main entrance on Walnut. It has a stone foundation which extends to the level of the first floor window sills and stone lintels and quoins. The walls are highlighted with ornamental, corbelled brickwork under the eaves. The windows are rectangular in shape, with the exception of six arched windows on the second floor of the central bay. The multi-sloped roof features dormers of three different designs.

The interior of the building was remodeled in 1947. It is divided so that the basement has two large offices: the first floor has three offices, two with vaults, connected by a central corridor; the second floor has four small offices, a conference room, a mail room and a reception area; and the third floor, untouched by the remodeling but with a partially dismantled floor, is an open area last used for storage. Remaining from the 1889 construction are the vaults on the first floor, a tile hearth and fireplace with a religious motif on the second floor, a spiral, iron staircase connecting the second and third floors, and the unfinished walls of the third floor.

HISTORY

In 1888 the W. D. Wood & Company, Limited, which had manufactured planished sheet iron since 1851 at the McKeesport site, was incorporated under the name of the W. Dewees Wood Company. Its capital was increased to $1,000,000 and it went from a limited to a corporate partnership.

The company wanted to increase its capacity, and, to better manage the operation, it was decided to expand the company's office on Walnut street. On October 19, 1888 the McKeesport Daily News reported that a three-story, brick, 68' x 48' addition would be built. The building would have large vaults in the basement, be built of stone to the level of the window sills, and be "imposing and attractive."

The office building was completed by May 1, 1889. The Daily News reported that it was "handsome," with four rooms finished in "quartered oak" with hardwood floors. The vestibules were finished in cherry, and hearths were made of "very fine tile." The rooms were "supplied throughout with electric bells, speaking tubes and electric light."

Apparently, the older part of the office complex--the part to which the 1889 addition was attached--was demolished sometime between 1894 (when it was portrayed in a print), and 1927. It is probable that it was taken-down to make room for the steel-shed building historically known as the "Box House and Cold Roll, Inspection and Finishing Department Building", but now known as Coupling Storage Building "D". Presently, there is no physical evidence for this earlier office building.

The W. Dewees Wood Company was acquired by the American Sheet and Tin Plate Company in 1901, a subsidiary of the newly-formed conglomerate, U.S. Steel, and it became known as the Wood Works. Despite the takeover, the office building continued to be used for payroll and direct management of the works. In 1947 the building was expanded to its present size and the interior was remodeled to accommodate the industrial engineers and production planners. Presently, the building is not used. It is on a parcel of property leased by the Camp Hill Corporation from the USX Corporation.

Historic Name: U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, Hospital
Present Name: USX Corporation, National-Duquesne Works, Camp Hill Drawing Room
Location: 375' south of the Monongahela River, and 575' west of the Main Pipe Mill
Construction: 1921
Documentation: Photographs of the Hospital can be found in HAER

No. PA-380-E.

DESCRIPTION

The Camp Hill Drawing Room is a brick building that was once the main hospital of the Wood Works. The interior of the building has been remodeled, but the exterior retains much of its original structure.

The one story building measures 23'-7" x 44'-7". It is composed of red, common-bond brick with a stone foundation and a brick chimney on the west side. A covered porch is located on the south side. There are rectangular windows with double hung sashes on each side. The gable roof is covered with sheet metal capped with tar. The emblem of the Red Cross is embossed on the north side of the building above the porch roof.

The interior is divided into three rooms: a copy room, and two storage rooms with drawing cabinets.

HISTORY

The Hospital is on the 1927 General Plan of the Wood Works. Acquired from the Wood Works of the American Sheet and Tin Plate Division of U.S. Steel in 1956, it was used by the National Tube Division as a Safety and Training Office. It appears to have been remodeled in the 1950s or 1960s. It is part of the parcel that USX leased to Camp Hill Corporation in 1988.

Historic Name:	U.S. Steel Corporation, American Sheet and Tin Plate Company, Wood Works, Clock House
Present Name:	USX Corporation, National-Duquesne Works, Instrument Shop
Location:	750' south of the Monongahela River, and 600' west of the Main Pipe Mill
Construction:	1921
Documentation:	There are no photographs of the Instrument Shop.

DESCRIPTION

The Clock House is a brick building that was part of the Wood Works. The interior of the building has been remodeled, but the exterior retains much of its original structure. Presently used by Camp Hill Corporation, it is in good condition.

The one story building measures 31'-1" x 14'-10". It is made of brick laid in a common-bond, with a stone foundation. There are rectangular windows with double hung sashes on the north, south, and east sides. The gable roof is covered with sheet metal capped with tar.

HISTORY

The Clock House is present on the 1927 General Plan of the Wood Works. It appears to have been remodeled in the 1950s or 1960s. It is part of the parcel that USX leased to Camp Hill Corporation in 1988. Camp Hill presently uses the Clock House as an Instrument Shop.

Historic Name: U.S. Steel Corporation, National Tube Company, McKeesport Connecting Railroad Office Building
Present Name: USX Corporation, National-Duquesne Works, McKeesport Connecting Railroad Office Building
Location: 390' south of the Monongahela River, and 425' west of the Main Pipe Mill
Construction: c. 1960
Documentation: There are no photographs of the Railroad Office Building.

DESCRIPTION

The Office Building measures 115' x 38'. It is a concrete block structure with rectangular windows and a flat roof. The interior is divided into several offices and storage areas.

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McDonough, W.G. "Oxygen as a Means of Increasing Bessemer Production." *American Iron and Steel Institute Yearbook* (1951): 164-81.
Describes experiment with oxygenated blast in 28-ton National Tube converter. Oxygen was used to melt additional

scrap overcoming hot metal shortage during furnace rebuild.

McDonough, W.G. "Oxygen as a Means of Increasing Bessemer Production." *Iron and Steel Engineer* 28 (August 1951): 116- 17.
Abstract of AISI paper on experiments with oxygen blast in acid Bessemer converter at National Works.

Mortson, E.T. "Instrument Maintenance." *Iron and Steel Engineer* 27 (September 1950): 61-64.
Outlines procedures implemented at National Works.

"National Tube Builds New Power Plant." *Iron and Steel Engineer* 27 (March 1950): 106.
Brief notice of construction on central steam station at National Works replacing fifty-seven low-pressure boilers.

"National Tube Company Completes New Boiler Plant at McKeesport." *Iron and Steel Engineer* 28 (March 1951): 116, 118.
Description of new central steam station fired by blast furnace gas with pulverized coal as auxiliary fuel.

"National Tube Promotes Smoke Control for Boilers." *Blast Furnace and Steel Plant* 39 (March 1951): 358.
Antipollution devices associated with new boiler plant at National include washers and electrostatic precipitators to clean blast furnace gas as well as dust collectors for ash.

"New Pipe Mill at McKeesport in Operation." *Blast Furnace and Steel Plant* 38 (May 1950): 582.
Submerged-arc welding of pipe up to 36" in diameter commenced at National Works.

"Pipe: National Tube Tries Plastic." *Iron Age* 171 (March 26, 1953): 77.
National installs plastic extrusion equipment at McKeesport on experimental basis. This is hedge against inroads of plastic pipe into steel market.

"Smoke Control Units Recover Iron Ore." *Iron and Steel Engineer* 27 (December 1950): 147-48.
New emission controls at National Tube include gas washers and electrostatic precipitators to clean blast furnace gas and dust collectors to trap fly-ash and recover iron particles.

Webster, Clarence J. "Combination Fuel Firing of Boiler Plant." *Iron and Steel Engineer* 31 (July 1954): 70-71.
Steam plant at National Works designed to burn either blast furnace gas or pulverized coal.

1960-1969:

"Electric Resistance Weld Pipe Mill Produces 80 ft. Lengths at National Works." *Iron and Steel Engineer* 41 (September 1964): 244.
Brief description of new facility for producing 5/8"-20" diameter line pipe.

"National Works Adding Rotary Hearth Furnace." *Iron and Steel Engineer* 43 (November 1966): 191.
The new unit will replace the No. 2 seamless mill billet heating furnaces.

"National Works of U.S. Steel Installing Rotary Hearth Furnace." *Blast Furnace and Steel Plant* 55 (January 1967): 63.
New furnace for reheating round steel billets will replace original equipment at No. 2 seamless mill.

"National Works To Have New ERW pipe Mill." *Blast Furnace and Steel Plant* 55 (March 1967): 243.
New underground looper and welder will enable 1964 ERW mill to produce pipe in a continuous operation.

"Oil-Coal Injection Saves $1000 a Day On Blast Furnace Coke." *Steel* 150 (April 9, 1962): 66-69.
By using fuel oil-coal slurry in blast furnaces, companies save money. Practice applied commercially at National Tube, McKeesport. Description of the new operating process is given, but not of the equipment.

"Process Reveals Flaws in Pipes." *Blast Furnace and Steel Plant* 48 (April 1960): 396-97.
Continuous fluoroscoping process in used at National since 1957 to inspect large-diameter electric-welded pipe.

U.S. Steel to Expand Pipe Facility." *Blast Furnace and Steel Plant* 50 (October 1962): 996-97.
Electric resistance weld pipe mill for tubular products. Eight 5/8"-20" in diameter will be installed at National.

"U.S. Steel Installing Large Pipe Straightener." *Blast Furnace and Steel Plant* 53 (May 1965): 418.
Seven-roll rotary pipe and tube straightener to be installed at National Tube Works.

"U.S. Steel Mill Produces Up to 80-foot Length Pipe." *Blast Furnace and Steel Plant* 53 (February 1965): 136-38.
Describes production process and equipment at National's electric resistance weld mill.

"U.S. Steel's National Works To Have Pipe Straightener." *Blast*

Furnace and Steel Plant 55 (February 1967): 184.
The 350-ton straightener will replace two existing units at No. 2 seamless mill.

"U.S. Steel Starts New Pipe Mill." *Blast Furnace and Steel Plant* 52 (October 1964): 964.
Electric resistance weld pipe mill at National transforms strip supplied by Irvin into tubular products.

<u>1970-1979</u>:

"Accurate Hardness Testing of Oil Well Casing." *Iron and Steel Engineer* 51 (July 1974): 107.
Captioned photo of apparatus for testing casing up to 135/8" in diameter at National Works.

"Pipe Mill Revamp." *Iron and Steel Engineer* 55 (April 1978): 56.
Size capacity of 1950 submerged-arc electric weld pipe mill will be increased from 36" to 40". Expenditures for equipment will include new tooling for U and O presses and mechanical expander, new scrubber heads, and repairs to auxiliary facilities.

"Tube Straightener." *Iron and Steel Engineer* 52 (February 1975): 95.
Sutton 7-roll tube straightener installed in high-strength casing line at National Works eliminates much processing previously performed on press straighteners.

"U.S. Steel's National Works Centennial." *Iron and Steel Engineer* 49 (November 1972): 121.
First 2"-diameter lap-welded tubing produced at McKeesport September 13, 1872. Current improvement program includes modifications to quench and temper line, installation of in-line rotary straightener, and threaders for No. 2 seamless mill.

"U.S. Steel Installs Twin Disc Universal Joint Assemblies." *Iron and Steel Engineer* 53 (August 1976): 85, 87.
U-joints replace slipper couplings on reeling machine drives at National Works' seamless mills.